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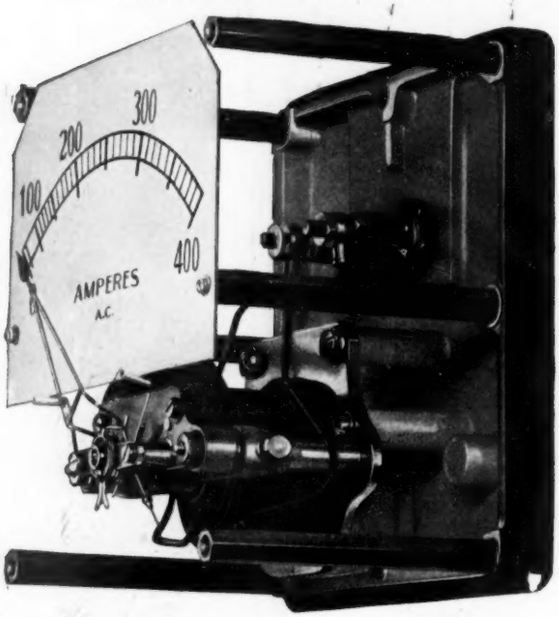

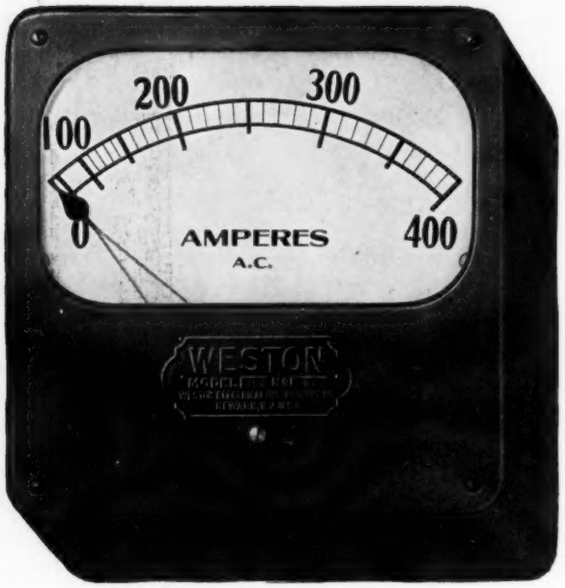

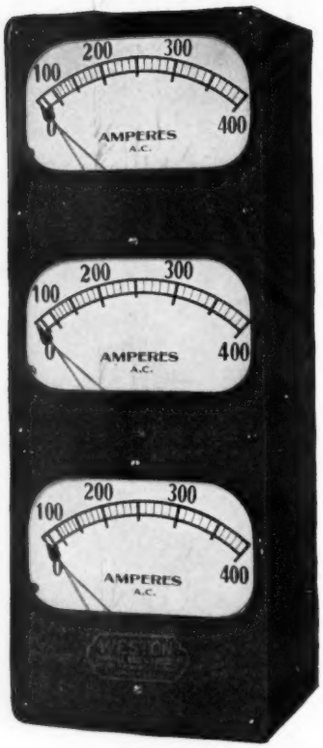

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The consolidation of Electrical World, Electrical Engineer and American Electrician

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World Power Conference Should Produce World Progress

THE World Power Conference was the practical manifestation of an attempt to get unison in international thinking by bringing together engineers, financiers, economists, politicians and scientists and thus to develop, by pooling their knowledge and their practice, a definite, logical and constructive plan for building the world of the future. The conference was a natural result of the international need for some definite and permanent means whereby all international agencies could go to work in expectation of accomplishing results worth while. It was the logical expression of international need for relief from economic and social conditions which are intolerable in many nations and are rapidly approaching this condition in others because a definite and constructive plan of development had not been produced by competent men.

Power is foundational to this sort of world-wide development. It has become the bread and butter of civilization and sustains the industrial and social life of all nations. A power survey on a detailed and international basis gives a reliable indication of the possibilities of each country for development and may be the means of causing an upward movement throughout the world. A pooling of ideas on the policies to be followed in the development of natural resources, in the generation of power, in the utilization of power for work, for transportation, for communication and for producing social comfort, will surely make for closer human business relationships between nations and in addition will aid greatly in bringing about an international and uniform program as regards policies, finances, practices and standards based upon the best knowledge and practices in existence.

Thus back of the technical, financial and statistical groups of papers, remarkable as they were for scope, depth and quality, there exists a meaning and a promise in the World Power Conference whose interpretation and consummation give hope for world-wide progress and prosperity in every phase of each nation's activity.

The "Technique" of Public Relations

MASTERY of good public relations can be attained by the humblest utility employee no less than by his chief executive, and in this fact lies the greatest hope for the future of the central-station industry. Courtesy among fellow workers and between these and the public, combined with good service at fair rates—this is the public relations problem solvent in a nutshell. Hundreds of thousands of words have been written on this subject, but its technique boils down to the application of these simple principles in the spirit of mutual service and with the desire to "go the limit" in striving to satisfy the prospective and the actual customer. Yes, there is a technique of this problem's solution; but it is so simple, once executive and subordinate responsibilities are realized, that failure should be impossible. Success is bound up in open-handed policies, in willingness to remedy unfavorable conditions and in everlasting appreciation of the customer's viewpoint. "Strong-arm" methods are taboo, and the only rigid rule that should prevail in the face of all circumstances is the golden admonition of the Scriptures. Fundamental, workable—this is the technique of public relations best able to disarm socialistic agitation and to cement friendly regard between the personnel of companies and their customers. Prosperity and content are built upon it.

Statistics Show Fire Hazards Reduced

THE marked and consistent reduction in electrical fire losses which has followed the black year of 1918—in spite of an increase of 31 per cent in the consumption of electrical energy—is the sole reassuring sign in the record of devastation imposed on the country by the inexcusable prevalence of fire hazards and public disregard of measures for the prevention of fires. The appreciation by the electrical industry of its responsibilities which has made it possible, with the help of the insurance interests, to put a stop to the growth in the electrical fire hazard and to bring about substantial annual reductions in electrical fire losses stamps the extension of electric service as in itself a highly potent preventive measure.

The increase in electrical fire hazard prior to 1918, as subsequent developments have shown, was due to conditions susceptible of improvement, and efforts to correct the evil were immediately apparent when this was appreciated. The first year the situation was in control—1919—there was a net reduction in electrical fire losses of 25.7 per cent and a reduction in proportional losses of 13 per cent, according to information gathered by the Society for Electrical Development. The next year the 1919 records were bettered by 16.4 and 31.4 per cent respectively, and each succeeding year has seen an improvement upon the preceding one, both in regard to net electrical fire losses and in the proportion of total fire losses they represent. In 1922 the electrical fire losses were actually 42.7 per cent lower than they were in 1918, and their proportional value had been decreased 67 per cent, or to slightly more than 2⅓ per cent of all fire losses for the year.

Resolved to per capita values, the improvement is even more emphatically shown by the record that while all per capita fire losses increased from $2.88 in 1918 to $4.67 in 1922, the per capita electrical fire losses decreased from 20 cents to 11 cents. Such an improvement should give great impetus to the extension of electric service and cause greater dependence upon it. It should also serve as a convincing example to other

industries of the value of putting their houses in order, for had other classes of fire hazards been reduced in the same proportion, the total fire losses for 1922 would have been about $167,000,000 instead of the sum of $506,541,000 actually recorded.

Keep an Eye on the Energy Losses

A KILOWATT-HOUR lost and unaccounted for is a definite loss of possible revenue or an additional burden thrown on system operating expense which must be paid for by the customers. The truth of this statement is not so keenly realized by many central-station operators as it should be. A recent study of a year's difference between the net output and the energy sold to consumers on a property group with a net annual output upward of a half billion kilowatt-hours shows a loss that would total over a million and a quarter dollars at a production cost of one cent. When a group of this kind is composed of a large number of relatively small units with small plants in which production costs are relatively high, the loss from such a source reaches a good-sized portion of the average revenue per kilowatt-hour sold. A figure of 20 per cent of the average gross revenue on small properties is not an unthinkable one.

In general it may be assumed that 15 per cent represents a fair energy-loss bogey for the average small system with a mixture of distribution and transmission circuits scattered over considerable territory. This figure ought to be reached easily. To get below it will require a strenuous program of persistent work. It is not at all uncommon to find systems answering this description which have losses of 20 to 30 per cent. That such figures can be reduced to approximately 15 per cent with a little intelligent thinking translated into effort is established as the result of experience. The price is merely a careful study of each natural property division, first using meter equipment to isolate the various losses. Each division having an excessive loss should then be analyzed in detail. In a distribution system small copper conductors and overcapacity of transformers are the two chief causes of energy loss for which search should be made. In the transmission system the same factors plus transmission voltages that are too low for the distances and loads handled are the usual causes. A careful study of each situation can be made to yield profitable results.

Evaluating Street-Lighting Costs

REVISION of street-lighting contracts, their renewal and the discussion thus aroused bear so intimately upon public policy that the importance of the contracts often exceeds their money value. It speaks well for the integrity of company executives and principal authorities that so few of these discussions reach the state commission stage. Political agitators sometimes attempt to use prospective or pending negotiations for street-lighting agreements as planks in campaigns, but where municipal and company representatives are disposed to play fairly such issues are better determined by conference and engineering analysis than by appeals to the voters or to regulatory bodies.

The basic problem is the proper evaluation of street-lighting costs. This should not be excessively difficult, considering the ease with which the specialized apparatus required for this class of service can be identified from the top of the lamp post back to the substation or generating-plant bus. To the fact that much of this apparatus is worthless for any other service due weight should be given by both parties. It is offset to some degree by the steadiness and duration of the load, but this counts for less than in years gone by when there was little interconnection of plants and systems.

The cost of lamps, poles, cable, ducts, transformers, etc., can be determined with sufficient accuracy to cause little difficulty in open-minded negotiations, and the operating expenses should offer small obstruction to rapid progress in negotiation. Fixed charges are apt to be valued diversely when the situation resolves itself into a group of "traders" on each side of the table, but a reasonable assignment of overhead allowances should not take many sessions. Very fair estimates of energy consumption can be compiled by knowing the hours of lamp burning and the ratings of units even where watt-hour meters play little part in the recording of this class of station output. A certain amount of "trading" is natural in these negotiations and gives no evidence of ulterior motives on either side. No company should object to being asked to put its detailed cost estimates on paper in justifying a proposed price for service, and the growing disposition of well-managed utilities to back up their price offers with these estimates is good to see. Where this practice is accompanied by respect for the figures of the purchaser and a desire to reach an equitable solution, one can safely predict a reasonably satisfactory outcome.

High-Voltage Cables a Co-operative Problem

MANY executives and engineers of utilities in metropolitan districts think practical and economic considerations call for the immediate use of high-voltage underground and aërial cables to operate at voltages in excess of 100,000 and considerable pressure is being exerted to secure them from cable manufacturers. On the other hand, cable makers and their engineers state that it is a very difficult task to make cables immediately for operation at voltages far in excess of those heretofore used. They claim it is as difficult a problem if not more so than to institute immediately overhead transmission at one million volts. And while no prohibitive technical or commercial handicaps to the manufacture of high-voltage cables are anticipated, they state development work and research studies are required which involve a time element of considerable magnitude and costs which will be very great in proportion to the amount of cable to be used.

At the present time therefore the high-voltage cable situation is rather acute and the negotiations going on involve questions of research, development, cost, delivery and quality of product. The most promising method of approach to better conditions seems to lie in the direction of co-operation. The central stations should help the cable makers with technical talent and money and should share the risks involved in the use of a new product untried in service. The cable manufacturers, on the other hand, should pool their technical knowledge in a co-operative way to place at the disposal of the industry the soundest plan for developing high-voltage cables quickly. It may be that some cable manufacturers feel that the technical knowledge of their staffs is their private property and gives them aid in commercial competition, but when it is considered

that no cables exist at the very high voltages considered and that the point at issue involves cables far beyond present commercial limits, there seems to be little real ground for this reaction to the co-operative proposal.

The core of the matter is that there is a practical and economic need for high-voltage cables immediately and that the frank and hearty co-operation of all interested parties should be able to secure the cables. It is too big a matter in the electrical industry to permit individual elements of a minor character to obscure the main objective. This viewpoint seems to be generally favored, and steps to secure the kind of co-operation required have already been taken.

Local Responsibility for the Home-Lighting Prize Contest

FIVE hundred thousand dollars in good hard cash, provided by the manufacturers of the electrical industry, is to be spent between now and the first of November by the lighting educational committee to put over the big nation-wide home-lighting campaign. There are in the neighborhood of 20,000,000 children of eligible age in the country to whom this offer of prizes will make an immediate appeal. If experience in similar contests means anything, a very large proportion of them will register and compete. In the process they will focus the attention of their entire households on the subject of good lighting in the home, during the time that they are studying the prize contest lessons, inspecting the illumination of their own house and the houses of neighbors, writing their short essays, selecting and pasting cut-outs of fixtures into the contest book to show how they would equip the model rooms presented there, discussing what makes lighting good and chattering about the prizes they hope to win.

On September 15 the national advertising of the contest will begin to appear in the popular magazines that these boys and girls read at home. On October 1 the schools will give out the campaign literature. The measure of the degree to which the youngsters of any city will be interested and concerned is the number that are enrolled there in the eighth and higher grades in all the public, parochial and private schools. These children and their parents in each community will be looking to the local electrical industry to tie into the national program and provide the local better lighting contest that will enable them to enter the competition for the alluring local and national prizes that they will read about in the advertisements.

Here is a great movement, conceived and provided on a scale more ambitious and more promising than anything ever before attempted by the electrical industry. It carries with it a very important responsibility that must be assumed by the electrical men of every city. Some one must lead in organizing the local contest that will tie that town into the national program. Because the central station will inevitably benefit so greatly through the better lighting that this education campaign will induce, the executives of the light and power company should promptly take the initiative, at least to the extent of seeing an effective local committee properly organized and financed. It would be a very serious matter indeed for the young people of any city to respond enthusiastically to the national advertising only to find that the electrical men of their town are ignoring the whole affair and that no local contest has been arranged.

Power-Factor Improvement Now a Financial and Commercial Problem

THE economic and operating advantages of a good power factor on a light and power system or in an industrial establishment have become well known as a result of the educational campaign waged during the past few years. But these advantages have not been realized to any great extent because of stumbling blocks encountered in instituting a commercial and practicable method to insure power-factor improvement or in establishing definite principles for handling the costs involved. On high-tension transmission lines operating requirements have called for the use of synchronous condensers and power-factor correction has followed as a corollary, but in metropolitan substations and in the most important location, the industrial establishment, little progress has been made.

It will be realized that the handicaps to progress are not of a technical character, for meters, synchronous condensers, static condensers and special types of motors have been developed on a commercial scale and their operating reliability and general economic and operating fields have been determined. Power-factor correction has developed into a financial, commercial and operating problem which involves such factors as the development of a financial basis for carrying the investment costs for meters and corrective equipment, the replacement of poor power-factor conditions with good power-factor conditions in factories—and this involves tests, operating and economic data, machine replacements and even a change in production methods; the revision of rate schedules and metering and billing methods, the allotment of corrective equipment in amount and type to substations and to customers' premises, the maintenance and operation of the corrective equipment under all conditions of system or factory load conditions, the "selling" of power-factor correction to all those producing, transmitting or using electricity, and the finding and collection of a return on the money required to get and maintain good power-factor conditions.

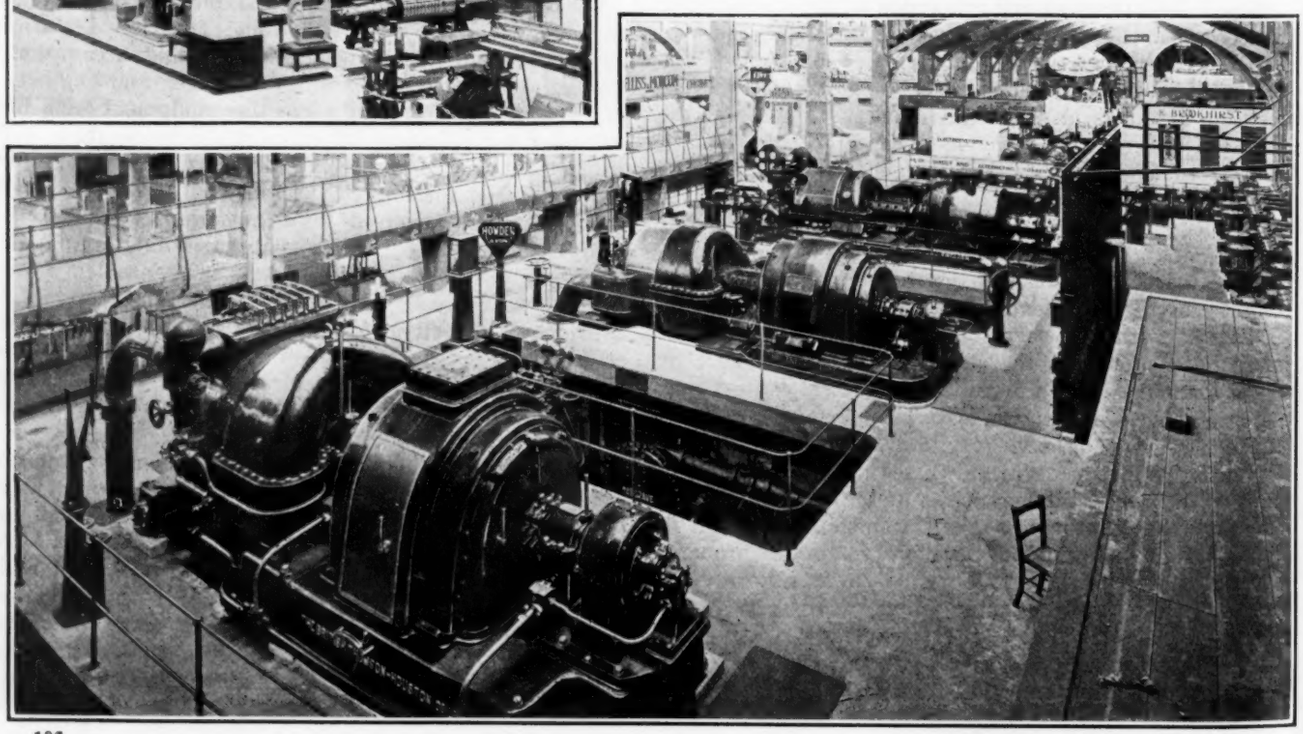
In addition to these inanimate factors, human factors are involved in the equation. The central-station executive, engineer, power salesman and accountant; the industrial executive, works manager and engineer, and the manufacturer of corrective equipment with his engineer and salesman all enter into consideration, and in the background are broad questions of policy, public relations, commission regulation and law. With all these elements involved is it any wonder that little progress can be recorded or that a pessimistic attitude is rather prevalent at this time? The problem is so big and so complicated that it is difficult to maintain a proper perspective or to devote the time and effort required to get a solution on a national scale. Here and there utility and factory representatives have worked out a solution that operates satisfactorily for the given conditions, and, as in the case of inductive interference, there is no doubt solutions can be worked out in a satisfactory manner for specific cases. Slowly but surely data in these isolated cases will build up a method which can be applied on a national scale to the problem, and in the meantime a co-ordinated and continuous effort should be maintained through the national committee of the industry to bring this national solution quickly to it. The problem is difficult, but the returns from its solution are of tremendous value and importance.

A Palace of Engineering

AT THE British Empire Exhibition, Wembley Park, London, an array of electrical products on an unprecedented scale constitutes a striking advertisement of the electrical industry. The electrical section contains practically all types of equipment, and one of the unusual features is the electric shop. This contains appliances of all types and includes (a) an exhibit of products forming a complete stock of an electrical retail store, (b) a demonstration of the best ways to stock and to display appliances, and (c) examples in window displays and interior illumination.

Another interesting display is found in a complete electrical installation in a replica of a ship's cabin. Switchgear, power equipment, high-tension devices and industrial electrical equipment are also found adequately displayed.

One of the most interesting features of the exhibition is the power station erected to supply the 7,500 kw. needed by the exhibition. This consists of three 1,500-kw. turbo-generators, a horizontal tandem compound steam unit rated at 300 kw., a four-cylinder vertical oil-engine unit, a crude-oil engine unit rated 180 kw., a small steam boiler and engine installation and a substation supply from one of the London power companies.



Low-Tension Tests on High-Tension Fuses and Resistors

Results of Laboratory Investigations Made by the Pennsylvania Water & Power Company at Holtwood to Determine Performance of Fuses With and Without Resistors

By P. M. HESS
Assistant Chief of Tests Pennsylvania Water & Power Company, Holtwood, Pa.

RESULTS obtained from high-tension tests on fuses, particularly the test with the short circuit on the low-tension side of the potential transformer, brought out the point that the resistor might fail or the potential transformer burn up before the high-tension fuse could blow.* Moreover, the addition of external resistance on the high-tension side sometimes produces an appreciable error in the ratio of a comparatively heavy loaded potential transformer. These probabilities led to a thorough investigation into the characteristics of all types of fuses and resistors that were used in the high-tension tests and also into the probability of a fuse deteriorating after being in service for a comparatively long time. It was held that deterioration was probably caused by corona.

The low-tension tests on these fuses were made in the laboratory of the testing department at Holtwood at 220 volts and 25 cycles. The connections used and the method for recording the time required for the fuse to blow are shown in Fig. 1. A cycle counter was used to record the time for the fuse to blow. Before testing, the resistance of the fuse was measured and a similar amount of resistance was inserted in the circuit in order to set the current value carefully at the desired amount. This being done, the resistance was short-circuited and the fuse put in the circuit. The cycle counter was then set at zero and the three-pole switch closed. This closed the circuit through the fuse and started the cycle counter. The instant the fuse blew, full potential was forced across the coil of the contactor, which closed and stopped the cycle counter. This gave an exact record of the time required for the fuse to blow. Several checks were made on the time lag of operation through the contactor with a maximum error of one cycle. This method was used throughout all the low-tension tests.

The following tests were made on low-tension fuses:

1. General Electric inclosed cartridge fuse No. 126,472, (a) new, (b) reloaded, single lead wire, 0.75 amp. rating, and (c) reloaded, double-end lead wire, 0.75 amp. rating.

2. Westinghouse inclosed cartridge fuse No. 37,228, (a) new, (b) reloaded, single lead wire, 0.75 amp. rating, and (c) reloaded double-end wire, 0.75 amp. rating.

3. General Electric expulsion type, reloaded, lead wire, 0.75 amp. rating.

The average results obtained from the tests are shown in Fig. 2. These results are comparatively accurate since each point on the curves is an average of many trials. Referring to the curves on the new fuses, it is seen that for both makes the curve is almost flat and remains so up to a certain point where it bends rapidly, showing that there is apparently a critical current at which the fuse holder can no longer dissipate the heat generated, thus causing the wire to fuse. This critical point is also probably due to the characteristics of the wire itself.

It is of particular interest to note that in the case of both the General Electric and Westinghouse new fuses it was found that the wires, which are rated at 0.25 amp. and 0.75 amp. respectively, did not blow at currents under 1.7 amp. for the General Electric and 1.50

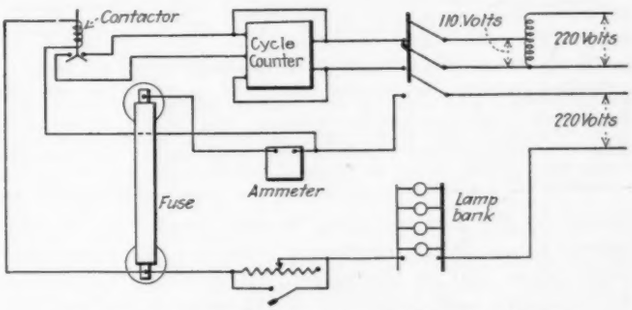


FIG. 1—ARRANGEMENT OF APPARATUS FOR MAKING LOW-TENSION FUSE TESTS

amp. for the Westinghouse. Again in the case of the lead wire rated at 0.75 amp. used for reloading, it was found that 2.5 amp. was required to fuse the wire, and for lead wire rated at 1 amp. 3.5 amp. was required. This is approximately 300 per cent of the rating in the case of the lead wire.

The slope of the curves for the same fuses reloaded with 0.75-amp. lead wire is more gradual and does not show a very definite critical point. This would tend to verify the fact that the characteristics of the wire are quite a determining feature. By comparing curves A and E, which are for reloaded General Electric inclosed cartridge fuses, A for single wire and E for doubled ends, it is plainly brought out that the portion of the fuse holder which retains the greater part of the heat (and thus caused the fuse to blow) is the end terminal. Doubling the ends causes less heat to be generated at this point and thereby forces the wire to fuse nearer the middle, where only a single strand carries the current. This point was verified by examining the blown samples. In the case of the single wire the fusing always occurred in the end terminal outside of powder.

Considering the case of the Westinghouse fuse re-

*The tests made on high-tension fuses and resistors for potential transformers were described in the ELECTRICAL WORLD for March 8, 1924, page 467.

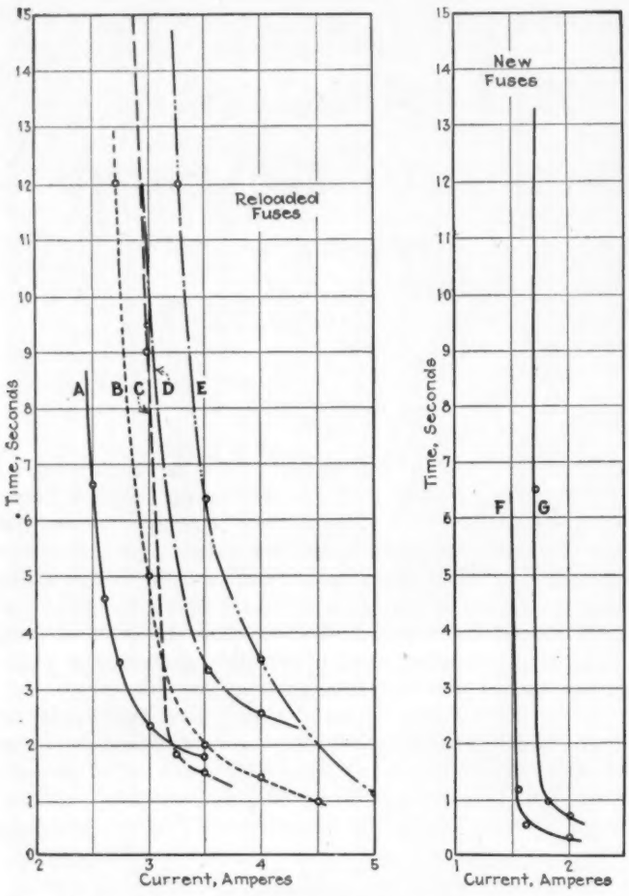


FIG. 2—TIME REQUIRED FOR LOW-TENSION FUSES TO BLOW

Right—Tests on new fuses. Curve F is for Westinghouse cartridge fuse and curve G for General Electric cartridge fuse. Left—Fuses reloaded with 0.75-amp. lead wire. Curve A—General Electric fuse, single wire. B—General Electric expulsion fuse. C—Westinghouse cartridge fuse, single wire. D—Westinghouse fuse, double ends. E—General Electric fuse, double ends.

loaded by the two methods, it was found that the two curves C and D approach each other for the lower current values, but as the current is increased they separate rapidly, and again (as in the case of the General Electric fuse) it was found that the single strand blew at a lower value of current. The probable reason that the two curves for the Westinghouse more nearly coincide is because the powder in this case extends to the point where the wire is soldered to the clip, while in the case of the General Electric there is an open space approximately 1 in. long and 0.5 in. in diameter in each terminal. It is in this open space that the wire would fuse in every case when reloaded with single wire throughout. For all these curves the fuses were mounted in a vertical position; however, tests were made with horizontal mountings showing no appreciable difference for either type of fuse. The comparatively similar result for both mountings is probably due to the fact that the fuse wire is held in place by the powder in the inclosed cartridge type and by an asbestos liner in the expulsion type.

ERROR IN POTENTIAL-TRANSFORMER RATIO DUE TO ADDITION OF RESISTORS

At one time the total load on potential transformers of one bus at Highlandtown substation was measured and found to be a maximum on A phase with a current of 2.92 amp. Since these potential transformers are connected delta on both high-tension and low-tension sides, the current in the low-tension winding would be approximately $2.92/\sqrt{3}$, or 1.68 amp. These transformers have a ratio of 13,200/110 volts, so the current in the high-tension winding would be 1.68/120, or 0.014 amp. on the high-tension side. With two General Electric resistors of 60-ohms resistance each in the circuit, the total voltage drop across the resistors would be 120 $\times$ 0.014, or 1.68 volts, on the high-tension side, which referred to low-tension values is 0.014 volt. This represents an error of 0.0127 per cent, which is a negligible quantity. These calculations were made assuming unity power factor since this would show the greatest error.

TESTS ON RESISTORS

For all the high-tension tests with resistors wire and carborundum resistors were used. The question arose as to whether or not these particular resistors would hold up on a sustained short circuit at a current for which the fuse would not blow. The most convenient and conclusive method to determine this matter was by making temperature runs at several current values, especially at a current for which the fuse would not blow. The temperatures to which both types of resistors will rise in a certain time at a definite current value are shown in Fig. 3. Considering 200 deg. C. as a dangerous temperature, it is seen that the General Electric resistor at a current of 1.7 amp. does not heat to a dangerous temperature until twenty-eight minutes has elapsed and finally becomes constant at 267 deg. C., at which temperature it showed no serious signs of distress (curve C). Again, referring to the new General Electric inclosed cartridge fuse, it was found that at 1.7 amp. it will blow in 0.25 seconds, showing that this type of resistor is suitable for this installation. Now, considering this same fuse reloaded with single 0.75-amp. lead wire, which blows at 2.75 amp. in less than 0.2 second, it is seen that the same resistor required approximately ten minutes to reach a dangerous temperature (curve B).

It was almost impossible to make a similar run until constant on the carborundum resistor because of the extremely high temperature involved, so a run at a lower current, 1 amp., was made with very unsatisfactory results. Curve A shows the rapid rise in temperature for a current of 1 amp., and when it is con-

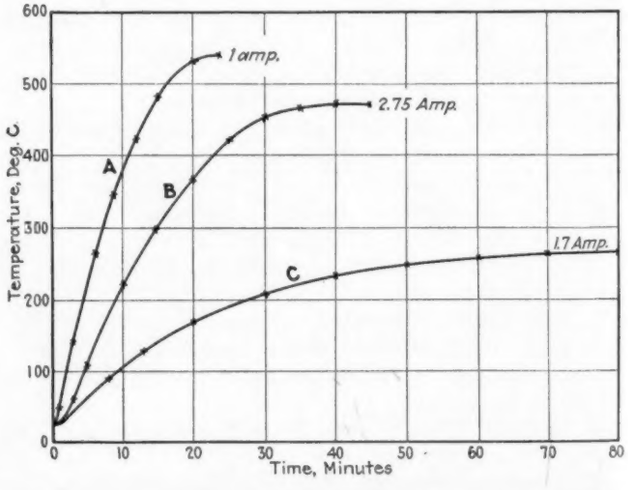


FIG. 3—TEMPERATURE RISE OF LOW-TENSION FUSE RESISTORS

Curve A is for Westinghouse carborundum resistor, while B and C are for General Electric wire resistors.

sidered that the minimum current at which a new inclosed cartridge fuse will blow is 1.5 amp., it is seen that this type of resistor is dangerous unless other means are employed to guard against low-tension short circuits. In two cases during these heat runs the carborundum rod broke completely in two parts at a temperature of 150 deg. C. and 210 deg. C. respectively, so these two instances alone are almost sufficient evidence to prove that this type of resistor presents a possible hazard.

In all, a total of ten heat runs were made on the wire resistors at currents ranging from 1 amp. to 4 amp. until constant temperature was reached and not a single case of failure or severe distress was shown.

DETERIORATION OF FUSE WIRE

Claims have been made that on numerous occasions fuses opened in service without any particular cause whatever, and it was therefore said that the wire had corroded or deteriorated in some way or other, causing

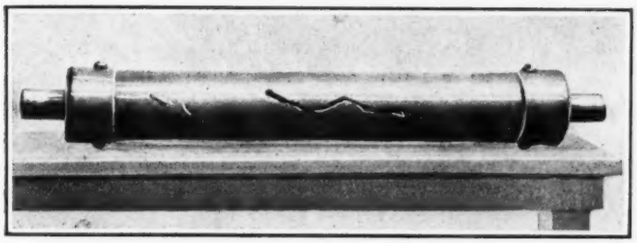


FIG. 4—DAMAGE DONE TO FUSE DUE TO DETERIORATION OF WIRE

it to separate, not because of current passing through, but owing to mechanical weakness, or rather a combination of both. Samples of both makes of inclosed cartridge fuses and the expulsion fuse showing this fault have been removed on numerous occasions.* A typical example of the damage done is shown in Fig. 4.

No complete record of fuse renewals has been kept by this company so it is impossible to determine the amount of service or time required for a fuse to deteriorate. However, three samples of the Westinghouse inclosed cartridge fuses were removed from service after a period of one year, and it was found that the blowing curve for these exactly coincided with the curve for new fuses. This would tend to show that no deterioration occurs for this type of fuse within a period of at least one year.

A few samples of fuses loaded with 0.75-amp. lead wire were also removed from service, and a visual examination showed that some chemical action had occurred in the form of oxidation. A microscopic examination showed a decided corrosion at various points along the wire. It is therefore evident that some at present unknown chemical phenomenon takes place, caused either by the atmospheric condition or by the surrounding electric field. The latter explanation has been suggested by several prominent research men, who think the corrosion due to corona.

Tests were made with wire (of 0.004 in. diameter) used in our potential-transformer fuses, spaced according to service conditions, and it was found that the first trace of visual corona appears at approximately 12,000 volts between phases, while at 13,000 volts the entire wire is giving off corona. This may account for some of the frequent cases where potential transformer fuses opened at Highlandtown without any apparent cause.

At Holtwood the record of potential-transformer fuses opening in this way shows but two instances since 1913, while at Highlandtown it is a frequent occurrence. The test for corona may account for part of this, since Holtwood operates at a voltage below the corona point (11,000 volts) and Highlandtown at a point above (13,200 volts). If corona does actually set up some chemical action on the wire, then there are reasons to believe that this is causing most of the trouble at Highlandtown. However, there still remains the difference in the atmospheric conditions of the two places, and this must not be neglected.

*It might be stated here that all new inferior fuses were found to contain 2-mil wire (0.002 in. diameter).

Influence Exerted by Altitude on Apparatus

Correction Factors for Various Types of Apparatus — Influence on Heating—Outputs and Ratings — Table for Any Height

BY KURT LUBOWSKY
Allgemeine Electricitäts Gesellschaft, Berlin, Germany

THE progress made in power generation in localities situated more than 1,000 meters above sea level has made it important to study the influence of the altitude on calculations connected with all apparatus which generates, distributes or consumes energy. Guarantees based on conditions in level country are generally valid up to 250 m. and as far as electrical machines are concerned up to an altitude of 1,000 m. above sea level. In altitudes higher than 1,000 m. considerable alterations must generally be made owing to the variation in the density, the heat conductivity, the dielectric strength of the air and in the amount of oxygen per cubic meter. The fluctuating influence of moisture and temperature and the slight decrease of the gravity are of no importance for engineering purposes.

When calculating electrical machines it must be taken into consideration that altitudes of more than 1,000 m. hinder the dissipation of heat per unit area, and where ventilated machines are concerned, the amount of cooling air delivered by the fan on the shaft of the machine is less. The decrease of the normal output of the various types is governed by laws which are based on the utilization, speed, voltage and ventilation. (Approximate correction: Decrease the output above 1,000 m. 0.5 per cent to 1 per cent per 100 m.) Self-cooled transformers can be adapted to the higher altitude of the site either by decreasing their normal output or by increasing the size of the oil tank. (Approximate correction: Without increasing the oil tank, decrease normal output above 1,000 m. 0.5 per cent per 100 m., or with unaltered transformer output increase the normal capacity of oil tank above 1,000 m. 1.33 per cent per 100 m.) The flashover voltage decreases approximately with the decrease of density. With high-tension apparatus and high-tension lines in altitudes above 1,000 m. the flashover voltage and the corona effect results in a decrease of the normal voltage or in the selection of greater distances between conductors. (Approximate correction: Decrease the working voltage of switchgear and insulators proportional to the relative density of the air or increase in reversed pro-

INFLUENCE OF ALTITUDE OF THE WORKING SITE

Influence Exerted on		Approximate Correcting Factors at Altitude Above Sea Level					
	Altitude, Meters	500	1,000	2,000	3,000	4,000	5,000
	Air Pressure, 760 at 0 deg. C Mm. Hg	716	674	598	530	470	417
				Per Cent			
Output of rotating electric machines	Rated output	Rated output	Rated output	95–90	89.5–80	83.5–70	77.5–60
Output of transformers:							
(a) Without increasing the oil tank	Rated output	Rated output	Rated output	95	89.5	83.5	77.5
(b) Increase of tank (transformer unaltered)	Rated capacity	Rated capacity	Rated capacity	113	127	140	153
Voltage rating of high-tension switchgear	Rated voltage and space	Rated voltage and space	Rated voltage and space	90	81	72	66
Voltage rating of high-tension lines:							
(a) Decreased working voltage of unaltered design	Working voltage	93	88	78	69	60	53
(b) Increased space of conductors and rated voltage of insulators	Normal design	107.5	113.5	128	145	167	188
Rating of cables	Normal design	Unaltered					
Starting and field resistors	Normal design	Unaltered					
Suction head of waterwheels:							
Theoretical suction head	10.33 m.	9.74	9.17	8.13	7.0	6.4	5.7
Maximum permissible static suction head	6.0 m.	5.41	4.84	3.8	2.7	2.1	1.38
Output of waterwheels	Rated output	Reduced in proportion to the total loss of head					
Output of internal-combustion engines:							
Fuel consumption	Rated output and fuel consumption up to 250 m.	97.5	92.5	82.5	72.5	62.5	52.5
		96	88	72	56	40	34
		101	103	108	113	118	123
		102.5	107.5	117.5	127.5	137.5	147.5
Output of steam engines exhausting into atmosphere		Depends upon steam conditions					
Output of wind turbines	Rated output	94.3	88.8	78.8	69.9	61.8	55
Suction head of pumps theoretical suction head	10.33 m.	9.74	9.17	8.13	7.0	6.4	5.7
Reciprocating pumps:		Valid for water of 15 deg. C.					
Most favorable manometric suction head	8 m.	7.41	6.84	5.8	4.7	4.1	3.38
Normal suction head	7 m.	6.41	5.84	4.8	3.7	3.1	2.38
Centrifugal pumps:							
Most favorable manometric suction head	6.5 m.	5.91	5.34	4.3	3.2	2.6	1.88
Normal suction head	6 m.	5.41	4.84	3.8	2.7	2.1	1.38
Input absorbed by air compressors	Rated output for constant volume at the exit	97.5	95	90	85	80	75
Input absorbed by fans		Unaltered					
Draft of furnaces		Depends upon local conditions					

portion the space between conductors and rated voltage of insulators.) Cables are quite independent of the altitude. Starting and field resistors may also be employed without any alterations.

Prime movers.—The suction head of waterwheels is influenced by the altitude, which must be calculated lower than for level land conditions owing to the separation of the air and the corrosion of the blades, whereby the output is also somewhat decreased because of a diminished drop. (Approximate correction: Reduce sea-level suction head equal to air pressure decrease in meters of water column.) Combustion engines which require a certain weight of oxygen with every stroke have a lower output, owing to a limited supply of combustion air, and therefore require a greater amount of fuel to obtain the same actual output. (Approximate correction: Reduce output in altitudes above 250 m. 1 per cent (to 1.6 per cent) per 100 m. in accordance with type and increase fuel consumption 0.5 per cent (to 1 per cent) per 100 m.)

Steam engines exhausting into atmosphere have their output increased slightly as a consequence of the diminished back pressure of the atmosphere (correction depends upon steam conditions). Wind turbines should have their normal output decreased in higher altitudes as the kinetic energy of the lower weight of the air is reduced. (Approximate correction: On the basis of a fixed velocity of the wind decrease the output in proportion to the density of the air.)

Working Machines.—Special consideration must be given to pumps. The maximum suction head of these must be decreased by the amount which when calculated in meters of water corresponds to the decrease of the air pressure. (Compare waterwheels.) Compressors with a definite end-excess pressure at the exit require a smaller amount of input on the shaft. (Approximate correction: Decrease the normal input $\frac{1}{2}$ per cent per 100 m. if volume delivered is to remain constant.) Compressors with a definite end-excess pressure at the exit require a smaller amount of energy, while fans must be calculated according to the constant volume delivered and are independent of the altitude as regards input requirements on the shaft. The decreased draft of chimneys should be compensated by altering their dimensions or by an artificial draft.

The data shown in the accompanying table are approximate correcting factors.

Correction on Judge Simpson's Address

IN THE issue of May 24 a very complete abstract was given of the address of Judge David F. Simpson before the N.E.L.A. entitled "Mutual Rights and Duties of Utilities on the Highways." Some corrections should be made in the article as printed in order to give a closer adherence to the exact words used in the address. On page 1092, first column, the next to last paragraph should read: "These considerations make clear the mutual rights and duties of utilities in the highways." On the same page, second column, the sentence "Stated in another way, the use by every utility of the highway is a use by it as a representative of the public" should be inserted in the paragraph under the subhead "An Unfortunate Tendency," just before the last sentence in the paragraph. On page 1093 in the first column the second paragraph should read "But it may be said that while this rule, etc." The omission of the works "But it may be said" has the effect of changing the meaning. —EDITORS.

Captions Inadvertently Transposed

In the article on "Railroad Yard Floodlighting" in the issue of June 28 the description and captions under Fig. 2 should be applied to Fig. 6, and the descriptive material and caption which appear under Fig. 6 apply to Fig. 2.

A 7,300-Kva. Automatic Hydro Station—II

Hydro-Electric Features of the Development—Design Details of Dam, Gates, Penstocks and Intakes—Cost of Station and Hydro-Electric Works in Graphic Form

By L. A. WHITSIT
Formerly Hydraulic Engineer Adirondack Power & Light Company

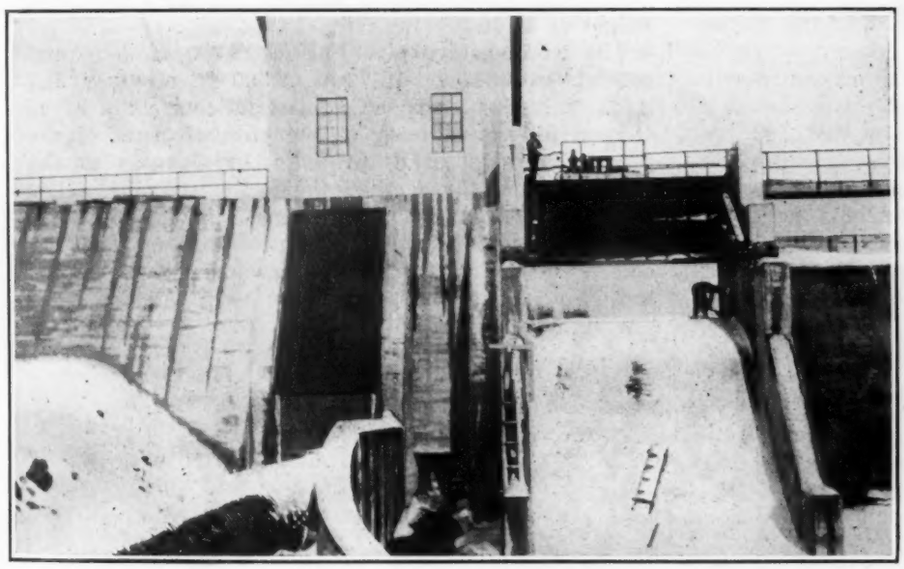
IN THE ELECTRICAL WORLD for June 28 the electrical features of the largest automatic hydro-electric station were described. Many interesting features were associated with the more strictly hydraulic part of the installation and the engineering analysis required to secure an economic and practicable installation.

Sprite Creek has its beginning at the outlet of Canada Lake and extends a distance of about 9 miles west to its confluence with East Canada Creek. In this distance the total drop of the stream is 625 ft. and this development conserves 410 ft. of fall at the upper end of the stream. The total present available storage capacity of Canada Lake and the three tributary lakes is 550,000,000 cu.ft., affording 7,800,000 kw.-hr. of storage in the new development and the energy for the Utica Gas & Electric plant at Dolgeville, the Inghams plant and the proposed Beardslee Falls development.

The principal features of the development consist of a new concrete reservoir dam 1,600 ft. below the old reservoir dam at Stewart Landing. The old structure was a timber-crib rock-filled dam which has been removed in order to afford an open waterway to the new structure. There is a pipe line, the first part of which is a wooden-stave structure and the lower end a steel-penstock line, and a surge tank is placed at the end of the wooden-stave line and the beginning of the steel line. The power house contains a single generating unit having a capacity of 6,000 hp. and a speed of 600 r.p.m. The natural creek bed was excavated for a distance of 700 ft. below the plant in order to afford a better tailrace discharge and obtain additional head. A wooden-pole transmission line 7.3 miles in length extends from the Sprite Creek power house to the Inghams station. It is a single-circuit line of No. 2 copper wire and is operated at 66,000 volts.

The length of the concrete dam is 580 ft., of which 270 ft. consists of a concrete core wall supported by a rock fill on the up and down stream sides. There is an overflow spillway section of 159 ft. on which provision has been made for 3 ft. of flashboards, and a solid rock foundation was available for the entire length of the dam.

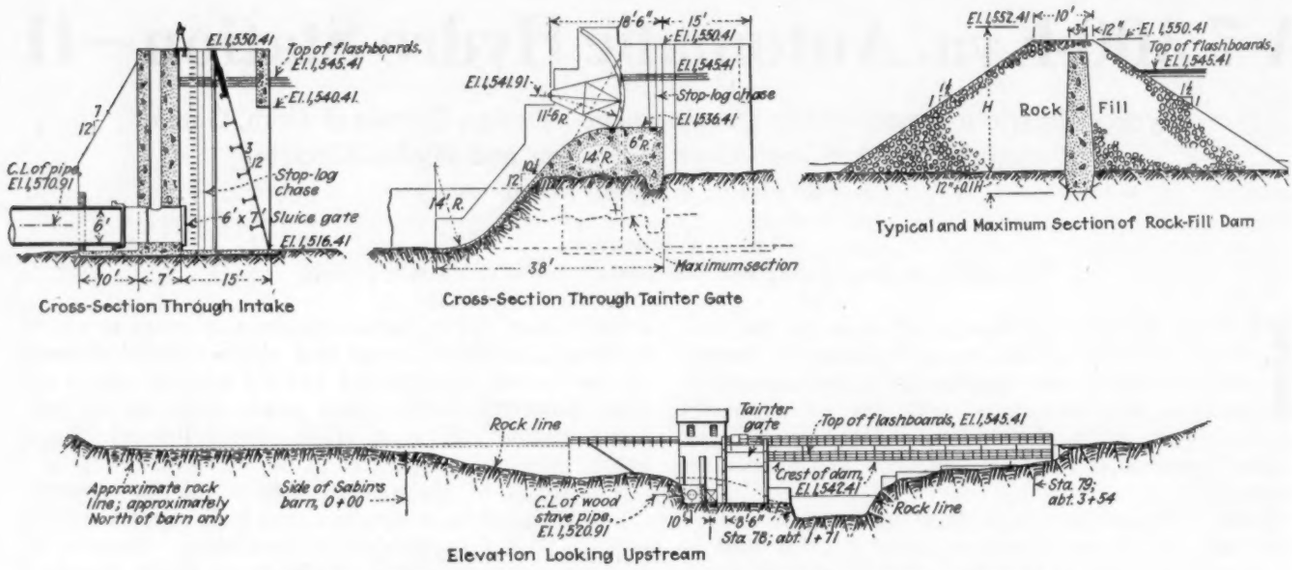
In order to be assured of the maximum benefits of reservoir storage in Canada Lake, the discharge capacity of the reservoir dam had to be made such that any sudden increase in water supply from summer rains will not result in damage to private property around the lake and still will permit full utilization of storage capacity. The operation of the flashboards will control the variation during the spring flood conditions. In addition to this feature a 9-ft. x 20-ft. Taintor gate is installed which will take care of all normal fluctuations in water level during the summer season. It is supplemented by a sluice gate 6 ft. x 7 ft. whose center is placed at 24.5 ft. below the reservoir elevation. The intake for the wooden-stave pipe line is at the same elevation. A vent pipe of ample size has been placed immediately back of the head gate for the pipe line, and the sluicegate is so placed as to assist in clearing



THE SPRITE CREEK DAM

This dam is 580 ft. long and 36 ft. high and contains an intake for a 7-ft. wooden-stave pipe line, a 6-ft. x 7-ft. sluice gate and a 9-ft. x 20-ft. Taintor gate. It has spillway 159 ft. long.

STEEL-PIPE LINE AND THE SURGE TANK, WHICH IS MOUNTED ON A TOWER



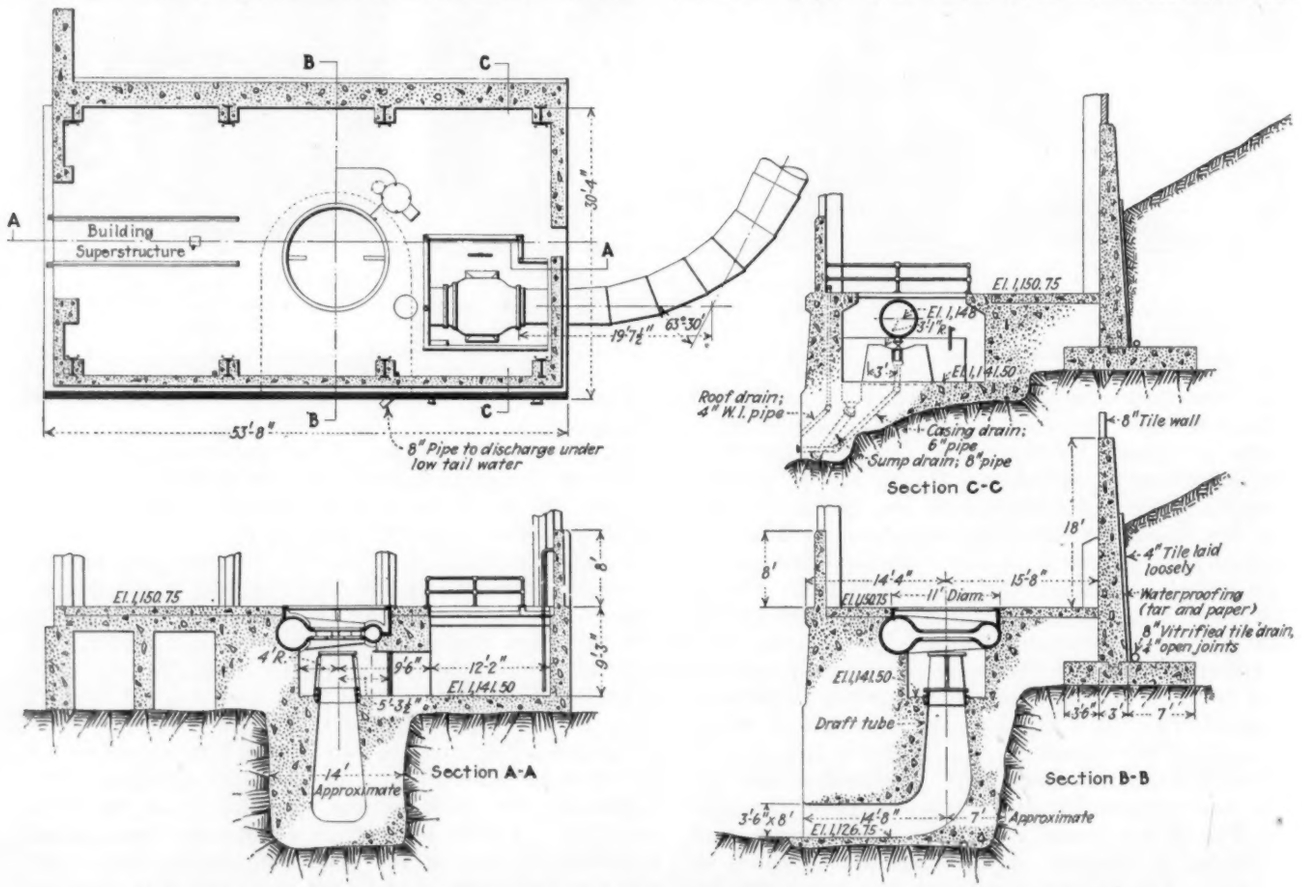
LAYOUT AND SECTIONS OF DAM, SHOWING CONSTRUCTION DETAILS OF THE WORKS

out sediment in front of the intake. The illustrations show the general design of the dam and of the rock-bar protection to the intake.

The dam has been designed so as to make it possible to raise the lake level at some future time should the value of additional reservoir capacity at that time indicate the economy of such a procedure. It will also be possible to gain additional storage by a lower draft on the reservoir after certain improvements have been made in the outlet channel of the lake.

Construction work was started on the dam April, 1923, and was completed in December, 1923. It contains about 4,000 cu.yd. of concrete and has a maximum height of 36 ft.

The wooden-stave pipe line is 15,980 ft. long and consists of 4,864 ft. of 72-in., 8,499 ft. of 66-in. and 2,617 ft. of 60-in. pipe. The material consists of 2½-in. Oregon fir staves, forty to the circumference of the pipe. The steel bands are ⅝-in. in diameter at the upper end and ¾ in. at the lower end of the pipe. They have a rolled thread and are spaced 8 in. for the 72-in. pipe, with varying spacings down to 1.6 in. on the lower end of the 66-in. pipe and 2.1 in. on the lower end of the 60-in. pipe. The staves were not creosoted. The



PLAN OF AUTOMATIC HYDRO-ELECTRIC POWER HOUSE, SHOWING DETAILS OF EQUIPMENT INSTALLATION

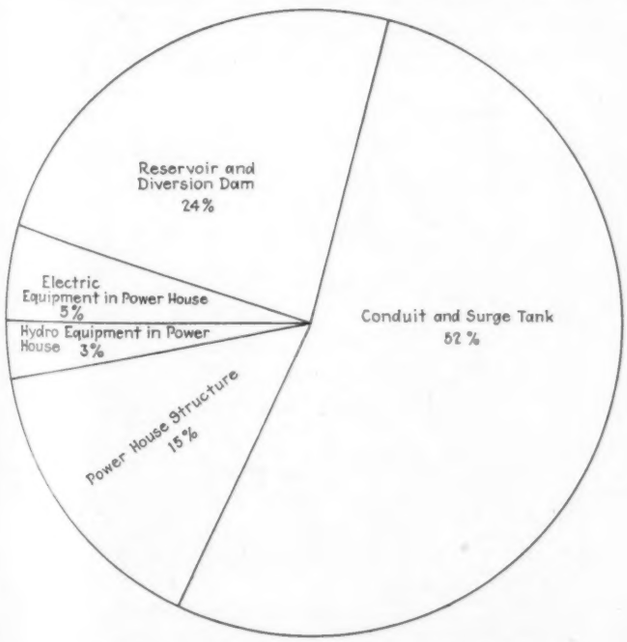
pipe is supported on creosoted cradles spaced on 10-ft. centers which rest upon 6-in. x 8-in. creosoted mudsills. Considerable rock excavation was required for the pipe line at the upper end, and for one-half of the length excavation consisted of large boulders and some side-hill excavation. The remainder of the pipe-line excavation was of normal character and not especially difficult. Three steam shovels were used for these operations, and the excavation was made somewhat larger than was absolutely necessary in order to provide continuing downward gradient from the dam to the power house. This is one of the important features of the development not usually incorporated in a pipe line of this length. It should improve the operating characteristics and decrease the chances of accident from collapse of the wooden-pipe line. There are two road crossings for which bridges were required, and at these points the grade of the pipe was placed below the natural ground surface. Work was started April, 1923, and completed in December.

The wooden-stave pipe line will not be buried at any point of its length, and therefore will be better preserved and open to inspection. Experience has shown that there is no danger of water freezing in a wooden-pipe line, although this is not true of a steel-pipe line. A 100-ft. strip is to be cleared on each side of the pipe to prevent falling trees from damaging the line, and special precautions are to be taken to cut the brush close to the ground in order to prevent damage from ground fires.

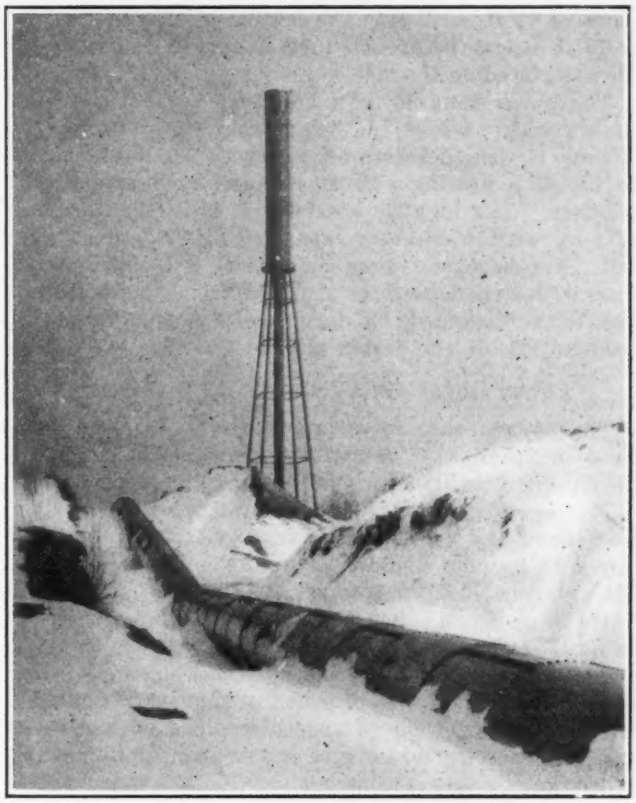
The gradient of the pipe is fairly uniform from the dam to the surge tank except for the first 3,400 ft., which is at a gradient only sufficient to furnish the required velocity. At the end of this distance an air-relief valve is installed to prevent accidental collapse.

STEEL PIPE LINE

The steel-penstock line is 2,300 ft. in length. It has a diameter of 60 in. for 2,250 ft. and a thickness of material varying from $\frac{3}{8}$ in. to $\frac{11}{16}$ in. The lower bend of the pipe line converges to 42 in. in diameter, which is the diameter at the entrance to the turbine. A


Reservoir and Diversion Dam 24%
Electric Equipment in Power House 5%
Hydro Equipment in Power House 3%
Power House Structure 15%
Conduit and Surge Tank 52%

APPORTIONMENT OF COSTS FOR THE SPRITE CREEK DEVELOPMENT



90-FT. X 12-FT., 6-IN. DIAMETER SURGE TANK
Mounted on a 130-ft. steel tower, the total height is 220 ft.

Wellman-Seaver-Morgan valve is placed at the entrance to the turbine and is mechanically operated. Advantage has been taken of the difference in diameters at the lower end of the penstock to maintain a continuous record of the amount of water used. The hydraulic characteristics of this convergence will be calibrated, and an integrated record of the calibrated discharge will be obtained automatically. One expansion joint is provided at the middle point of the steel pipe and the pipe is securely anchored at a point where it joins the wooden-stave pipe line and at three bends in the alignment. The steel line is to be buried throughout its entire length in order to prevent the water from freezing.

The cost of the wooden-stave pipe line per foot at the point of junction with the steel was about the same as the cost of the steel. It would have been possible to have extended the wooden-stave pipe line further, except that this point was the logical location for the surge tank and therefore the beginning of the steel construction.

DIFFERENTIAL SURGE TANK

The installation of a surge tank was thought preferable to a relief valve. The decrease in cost of the wooden-stave pipe line by virtue of the increased pressure rise that would have had to be provided with a relief valve was sufficient to pay for the surge tank. Foundations for the surge tank were not of a character or elevation that could have been desired and consisted of a very fine sand of unknown depth. A 90-ft. tank with a diameter of 12 ft. 6 in. and an inside riser of 3 ft. 6 in. was determined upon, and as the natural ground elevation was 190 ft. below the forebay elevation, it was necessary to support the tank on a tower 130 ft. high. The base of the tower was made of a

concrete mat 3 ft. in thickness and with outside dimensions of 42 ft. x 42 ft. The bottom of this foundation is 15 ft. below the ground surface, and a compact backfill was placed on the mat.

The surge tank is in a very exposed position and in a country where the temperature is very low at times. It was therefore necessary to lag the tank and to install a heating system for use during very cold weather. The lagging consists of a double thickness of 1-in. wooden sheeting separated by "Neptune" hair felt. The heating system consists of two closed steam lines with a condensate return. Electrical thermometers are to be installed by means of which the actual temperature of the water will be known.

POWER HOUSE AND GENERATING EQUIPMENT

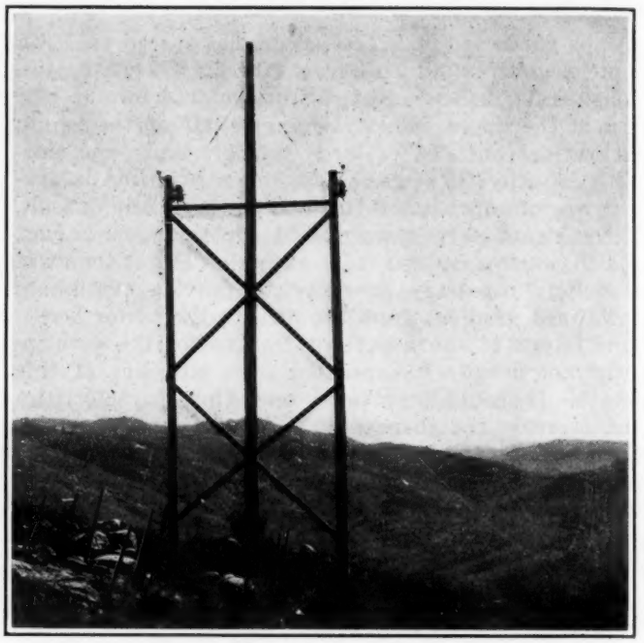
The power house is a structure with inside dimensions of 26 ft. x 48 ft., with a clear inside height of 37 ft. The substructure is reinforced concrete on a solid rock foundation. The superstructure is a steel framework and flat-steel roof trusses. The wall structure consists of a single thickness of hollow tile having dimensions of 5 in. x 8 in. x 12 in. The outside and inside faces of the brick are combed with a vertical fluting. This type of tile is a little more expensive to place than ordinary brick, yet the placing of the single thickness of tile provides a finished inside and exterior surface. There are three lines of cored-out spaces in each tile which give it a heat-insulation characteristic strongly recommending its use for hydroelectric power houses. The roof consists of hollow gypsum tile on which a Barrett roofing is placed. The outdoor substation structure is galvanized steel and joins the west end of the power house.

POWER HOUSE EQUIPMENT

The generating equipment consists of one Worthington turbine rated at 6,000 hp. at 370 ft. net operating head operating at 600 r.p.m. The governor is also made by the Worthington company and is equipped with the automatic devices above mentioned. A General Electric generator having a capacity of 7,300 kva. and an operating voltage of 6,000 is placed on a cast-iron distance piece which in turn rests upon the cast-iron scroll case of the turbine. The turbine, distance piece and generator therefore make one self-contained and metal-connected unit.

The power house is equipped with a 30-ton electrical crane. A heating system is installed for use during periods when the unit is not running. The heat-insulation characteristics of the wall and roof structure are such that, together with the small inside dimensions, the heat from the operating unit will easily keep the station at a comfortable temperature. Three 2,500-kva. transformers are installed in the outdoor structure for raising the voltage to 66,000, and a track arrangement has been provided for taking the transformers into the station in case they have to be dismantled.

The plant was placed in operation on February 18, 1924. The annual output of an average year will be 15,000,000 kw.-hr. The design and construction drawings were prepared by Vielé, Blackwell & Buck, New York City. The wooden-stave pipe was built by the American Wood Pipe Company of Tacoma, Wash.; the surge tank by the Chicago Bridge & Iron Works; the steel penstock by the M. H. Treadwell Company, Inc. The major portion of the construction was done by the company's own forces.



THREE-POLE WOODEN STRUCTURE USED FOR SUPPORTING 4,437-FT. SPAN

Wooden Pole Towers for Long-Span Construction

Details of the Installation of Two Spans More Than 3,000 Ft. Long—How the Installation Was Made—Steel Wires Used

BY K. B. AYERS

Superintendent Electric Transmission and Distribution, San Diego (Cal.) Consolidated Gas & Electric Company

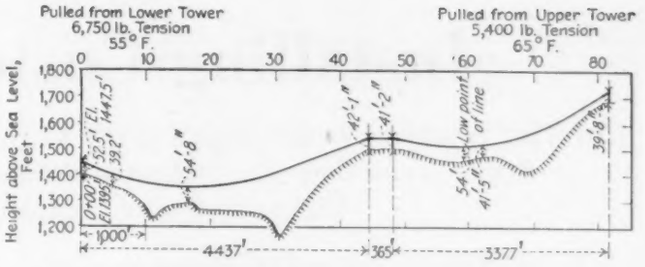
WHAT are believed to be the longest spans supported by wooden-pole structures were recently installed by the San Diego Consolidated Gas & Electric Company near Alpine, Cal., in connection with the construction of an 11,000-volt transmission line. The longest of the two spans is 4,437 ft., while the other is

BILL OF MATERIAL FOR WOODEN-POLE SPANS FROM 2,500 FT. TO 3,500 FT. LONG

Item	Description	Quantity
1	Class A cedar poles, per drawing	3
7	⅝-in. x 5-in. galvanized lag screws	5
13	Spring clevises	3
14	Suspension insulator units	75
19	Ohio Brass Company suspension wire clamp No. 10755	3
23	⅜-in. galvanized-steel strand ground wire	95 ft.
24	1½-in. galvanized fence staples	16
25	4-in. x 30-in. No. 26 galvanized-iron pole collars	18
26	Ground wire molding	65 ft.
27	Molding straps	18
28	3-in. No. 13 galvanized screws	36
29	Grounding pipe	1
34	Extra-galvanized high-strength steel strand	785 ft.
35	⅝-in. x 3½-in. galvanized lag screws	34
36	⅜-in. extra-galvanized 5,000-lb. standard steel strand	450 ft.
37	Three-bolt guy clamps	105
38	5½-in. brown porcelain strain insulators	14
39	Cement anchor blocks	14
40	¾-in. x 8-ft. anchor rods with ¾-in. galvanized thimbles	14
41	Anchor boxes	14
44A	Special multiple strain yokes	3
46A	2-in. x 8-in. x 22-ft. O. P. rough boards	1
46B	2-in. x 8-in. x 20-ft. O. P. rough boards	4
48	¾-in. x 14-in. galvanized machine bolts, two round washers and one nut	8
49	¾-in. x 16-in. galvanized machine bolts, as in item 48.	2
50	¾-in x 18-in. galvanized machine bolts, as in item 48.	10
51	¾-in. x 20-in. galvanized machine bolts, as in item 48, but with four washers	6
61	⅝-in. galvanized thimble	3
67	⅝-in. x 10-in. machine bolt with round washer and nut	3
S1	Pin-type porcelain insulator	3
S2	No. 3020 Hubbard channel pin	3

3,377 ft. The supporting structures, consisting of extra-heavy carefully selected poles, are of the type shown in the accompanying illus'ration. Three of these consist of two 50-ft. and one 65-ft. pole, and the fourth of two 60-ft. and one 75-ft. pole. The poles are all set in concrete with three pyramid-cement anchors holding the direct strain. In addition to side guys each pole is guyed in the direction of the strain to prevent backlashing in case of failure of any of the conductors. The towers are latticed with 2-in. x 8-in. timbers 30 ft. long to give rigidity to the structures.

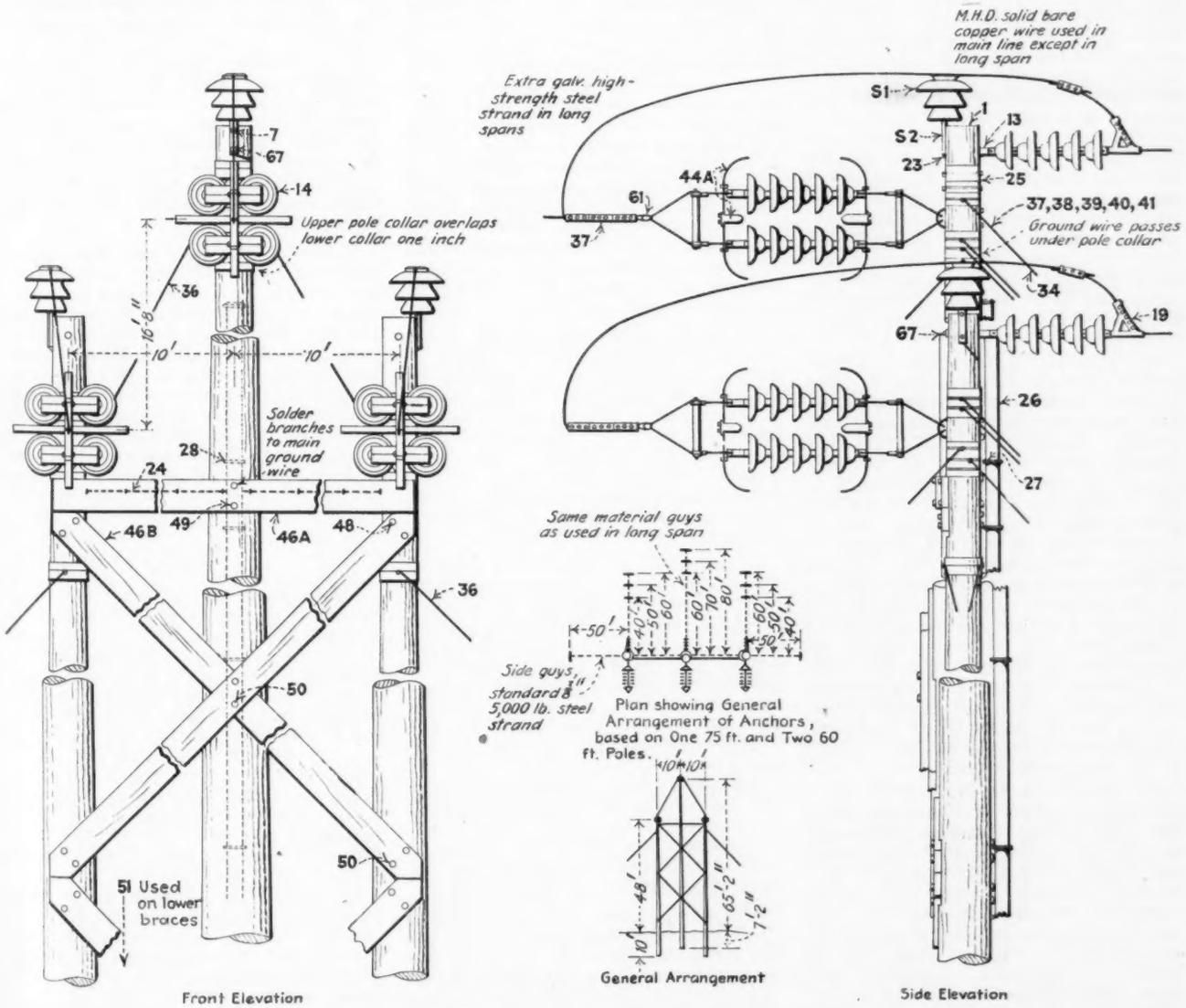
The conductors in both of the spans are of seven-strand $\frac{7}{16}$-in. extra-high-strength double-galvanized plow-steel wire, having an ultimate strength of 22,500 lb. and a weight of 0.39802 lb. per foot. Each conductor is supported at both ends by a double yoke having four strings of three 10-in. suspension insulator units and is passed around a 7-in. sheave and made up on itself with three-bolt clamps. In pulling up the spans the wire was first strung out and permanently dead-ended at one end. At the other end the wire was then passed over a snatch block at the top of the pole and the slack taken out with a pair of 8-in. blocks, after which the final pull was made with a pair of 10-in. blocks, without a luff, by a four-wheel drive truck.



PROFILE OF LONG TRANSMISSION SPANS

After the wires were pulled to a predetermined sag and stress they were marked with a piece of tape and then lowered and made up around the dead-end sheave. A "dutchman" was then applied, the final pull made in the same manner as originally and the sheave attached to the insulator yoke.

The soil at this point is mostly of disintegrated granite with numerous large boulders. Compressed air supplied by a compressor mounted on a truck was used for the paving-breaker air hammers. The boulders were drilled with air-jack hammers and shot with dynamite. This construction is in a light loading district where neither ice nor very low temperatures are encountered.



DETAILS OF LONG SPAN SUPPORTING STRUCTURE

Installing Customers' Services

In This Analysis, Which Refers to the Methods Followed in Different Parts of the United States, Tendencies Are Indicated Which Should Be of Interest to Every Electric Light and Power Company Throughout the Country

A SURVEY of public utility practices when installing customers' services and meters has been made by K. H. Bausman, supervisor of meters Dayton Power & Light Company, for the meter committee of the East Central Geographic Division of the National Electric Light Association. Data were collected from twenty-four companies on ninety-eight subjects, forty-five of which dealt with single-phase service, thirteen with polyphase service, twenty-six with underground direct current and thirteen with general subjects. The practices have been classified by subjects by Mr. Bausman so that practices can be followed through any company or compared. For the benefit of ELECTRICAL WORLD readers these data have been analyzed and an attempt has been made to show the tendencies or consensus of opinion of electric utilities. Among the practices included are those with regard to services to subdivided buildings, two-wire versus three-wire services, limitations on conduits, conduit fittings and wire size, identification of wires, service and meter locations, main-line switches and fuses, types of meter-service switches, self-contained versus shunted meters, 440-volt versus 110-volt meters and 5-amp. versus 10-amp. meters.

Services for Subdivided Buildings and Double or Duplex Homes.—Ten of the twenty-four electric companies reporting require three-wire service to double and duplex houses for single-phase lighting installations where more than one meter is installed, if the individual meters are the two-wire type. About half this number do not require three-wire service, and seven companies say that it is conditional. For example, one company says three-wire service is required for such installations if there are more than five circuits, another if there are four or more meter loops, another if there are four 9-amp. circuits or more, another if there are more than three branch circuits, another if there are more than ten circuits, and still another if there are more than forty-eight sockets (total) connected.

In general, direct-current underground service is provided to each property containing subdivided buildings, with laterals supplying each subdivision inside the building line. Usually these are made at the customer's expense. One company says that when the company's mains are underground an underground service connection will be installed without expense to the customer if the building to be served has a basement and is on the property line adjacent to the company's underground mains. If an underground service connection is required for a building back of the property line but adjajcent to the company's underground main, that portion of the service connection inside of the property line will be made by the company at the customer's expense.

Two-Wire Versus Three-Wire Service.—The majority of companies claim that the average residence three-wire installation is one of the most unbalanced three-wire loads commonly met in central-station practice, only three companies saying that they have not had this experience. As a result, the opinion stands fifteen to four that the best future practice in making residence installations having up to six or eight old code lighting circuits would be to employ two-wire service and balance one customer with another on the same three-wire secondary, rather than making the individual installations three-wire.

Direct-Current Service.—The replies to questions on direct-current underground service seem to indicate that companies are rapidly getting away from or limiting the boundaries of direct-current service, at least nine companies out of the twenty-four which reported now having no direct-current service. The companies which do employ direct-current underground service terminate in a variety of ways, namely, subway boxes, fused service cabinets and by running lead-covered cable to a main switch. As a rule the meter board is placed at or very near the underground tube.

Sealing Direct-Current Service Tubes Against Water and Gas.—A variety of methods are employed to prevent the entrance of water and sewer gas to direct-current underground service tubes, a number of companies employing drainage, together with jute, cement, wooden plugs and cement, asphaltum mixed with compounds, cotton waste and roofing or plastic cement, etc.

Requirement of Rigid Iron Conduit.—In single-phase services twenty-one of the companies replying to the questionnaire reported that they require continuous rigid-iron conduit from the service drop to the meter switch; one company permits either flexible or rigid conduit, while six companies prohibit the use of concealed rigid conduit. Where rigid conduit is required, exposed runs are preferred.

Except for primary wires in vaults, etc., sixteen out of eighteen companies require that all unmetered wires be run in conduit. Not one of the companies permits metered and unmetered circuits to be run in the same conduit.

Minimum Size of Service Conduit.—In general, ½-in. and ¾-in. conduit are the minimum sizes permitted by the electric companies under the 1920 and 1923 National Electrical Code rulings respectively, although two companies require that the minimum size be 1 in.

Condulets and Pull Boxes in Unmetered Conduit Circuits.—In general, condulets or pull boxes are not permitted in single-phase unmetered circuits carried in conduit, pull boxes being discouraged more than condulets.

Most of the companies object to the use of flexible conduit for any unmetered circuit, although five companies reported that it is permissible if the conduit is continuous. In case condulets are used they should be sealed. In some cases the slots in the screw heads used to fasten the covers on the condulets are filed out so that they cannot be removed.

Minimum Size of Wire.—For single-phase residence lighting installations No. 10 wire is the minimum size permitted in service conduit in most cases, although about half the number specifying this size require No. 8 and some No. 6 and even No. 2. For 7-kw. to 10-kw. domestic ranges No. 6 wire is the minimum size generally specified, two companies permitting No. 8. One company says that the size of the wire to serve the conduit running to electric ranges should depend on the length of the circuit. For example, for 100-ft. runs No. 6 should be used, for 200-ft. runs No. 3, for 300 ft. No. 1. These figures apply to a 10-kw. range. In the discussion of the subject it was brought out that the service cost is equivalent to almost one-half the price of the range, hence if any money can be saved in the service it is well worth while. Tests by one company of the potential drop of three No. 4 and three No. 8 wires showed that the maximum drop is only 4 volts with the No. 8 wire and 2 volts with the No. 4 wire; hence No. 8 wire is used, as there is a 5-volt drop in the range itself. This permits a saving of $25 to $30 out of $90 total service cost. The average demand is 2½ kw. to 3 kw.

In general No. 6 wire is the minimum-size service wire permitted on 60-amp. service switches, about half the number of companies requiring this size specifying No. 8 and still fewer requiring No. 4 wire.

In connection with 100-amp. service switches, the minimum size of service

wire is not so definite among the companies reporting, Nos. 6, 4 and 2 being about equally used, and two companies even require No. 0 wire.

Identification of Wiring. — Eighteen companies are requiring identified wiring and six are not. Eight of those using marked wiring employ white braid for identification, while the others resort to colored braid, peeling the insulation, knotting the wire or marking with a bank of tape.

Designating Service and Meter Locations.—Seventeen of the companies reporting indicate the position of the service and meter location to the contractor, three do so only upon request, some give only the service location, and others do not give any indication. The indication is given in most cases with a tag, sticker or card, and in some cases by oral instructions. Where this is not done, the companies rely upon general instructions given in their service rules. Where the service or meter is not installed at the point desired, service is withheld until locations are made satisfactory.

In the discussion it was pointed out that it is very difficult to secure the cooperation of plumbers and gas companies in avoiding conflicts.

Minimum Height of Service Outlets. —The minimum height of the service outlet specified by the electric companies varies from 8 ft. to 25 ft., the average being 14 ft. Where the service outlet cannot be placed at the height specified, companies vary in practice, some permitting it to be installed at the highest point practicable, others 10 ft. above grade, others requiring a pole or riser to provide the required elevation and still others requiring an underground service.

In the committee's discussion of the subject the question was raised whether there is any need of requiring extreme elevations of service conduit. Conduit comes in 10-ft. lengths; hence the rule should permit a height which is some multiple of 10 ft.

Preferred and Prohibited Meter Locations.—While the companies differ in some respects regarding preferred meter locations for single residences, the composite opinion is that the locations rank as to desirability in the following order: Basement, garage, inclosed porch, kitchen and hall. Most of the companies object to exposed positions or extremes of temperature. In general, the location must be easily accessible for reading or testing and must be clean and dry, free from variations in temperature and thoroughly protected from the weather as well as from mechanical damage.

The composite opinion of the same companies lists the following as among objectionable locations for meters: Living room, dining room, bedroom, toilet or bath, stairway, over heater, stove, door, sink or laundry tubs, attic, clothes closet, pantry, open porches, fruit or coal cellars, display windows, elevator or air shafts, box office or operator's room. In general, locations are prohibited which are relatively inaccessible to periodical visit, which cause annoyance to customers or do not meet the requirements previously outlined.

Maximum and Minimum Height of Meters.—According to the maximum and minimum heights prescribed by twenty-four companies, the average maximum is 6½ ft. and the average minimum is 4 ft., although the extreme maxima range from 5 ft. to 8 ft. and the extreme minima from 2 ft. to 5 ft. It was the consensus of opinion of the committee that 6 ft. should be the maximum height.

Main-Line Service Switch. — For single-phase service to double or duplex houses or subdivided installations where two or more meters are installed on one service nine companies require that a main-line service switch be installed in addition to the meter switches, seven do so under certain conditions and five do not so require. For example, one company says that it does not use line switches on installations involving a number of meters unless there be a considerable number of such meters, in which cases a main switch and main fuse, together with branch fuses, are used in addition to the main switch and main fuse for each individual customer. Another company says that if both meters can be located within 4 ft. of the service entrance and made accessible to both parties, the main switch may be omitted. However, in the case of more than two meters the main switch is required. If meters are installed in one private basement or individual basements where a main-line switch is required, the switch is made reasonably accessible by placing it in some public part of the basement, outdoors or in some inclosure to which a key is furnished. It was the consensus of opinion of the committee meeting that the requirements of the National Electrical Code on making the main-line switch accessible should receive a common-sense interpretation.

Similar practice exists regarding the location of the main-line switch for underground direct-current service to sub-divided buildings having no common basement. The main switch is placed in the most accessible position. In the case of one company a special cast-iron box is set in the foundation wall with a door opening to the outside for inclosure of the service entrance switch. However, such construction is only adopted where no other course is possible.

Main-Line Fuses. — Where meter boards are installed by or near the underground direct-current service tubes the practice is varied regarding the requirement of a main-line fuse switch at the service tube. One company requires a main-line switch at the subway box, another not unless five meters or more are installed, another for all gang-meter installations, but in general not for a single meter installation.

When the meter board is located some distance from the service tube, a main-line fuse switch or its equivalent is generally required at or near the tube. With one exception the companies reporting also require a main-line fused switch on the meter board when it is located at some point distant from the tube.

Largest Main-Line Fuses Permitted. —The practice regarding the largest main-line fuse which shall be permitted on underground direct-current services varies considerably, two companies limiting them to 600 amp., one to 400, one to 750, one to 1,000, and one company having no limit. Where a circuit breaker is required, there are generally no specifications, although one company says that they should be the equivalent of General Electric K-5, Westinghouse F-22 or Condit E-1.

Largest Fused Switch.—The practice regarding the largest fused switch which will be permitted or recommended on polyphase service is varied, four companies having a limit of 400 amp., three of 600 amp. and one of 800, one of 1,000 and one of 1,200 amp. Some companies have no limit.

Oil Switches on Large 220-Volt or 440-Volt Installations.—Thirteen out of sixteen companies recommend oil circuit breakers as service switches on large 220-volt or 440-volt installations.

Type of Meter Service Switch Required.—In single-phase, polyphase and direct-current installations some type of safety switch is required in most cases, although they do not seem to be demanded for direct-current installations as much as for single-phase and polyphase installations. Some companies require that these service switches provide testing facilities, have a blade and fuse ahead of the meter coils, have interchangeable meter trims, etc.

Ten companies specifically require safety-type meter-service switches for polyphase service; the others allow any approved type.

Number of Circuits Permitted on Two-Wire, 115-Volt Service.—On the average, companies permit four circuits on two-wire, 115-volt residence services and three on commercial services, although the extremes are from two to five for both classes of service. Although the new National Electrical Code ruling on number of outlets on branch circuits allows 15-amp. fuses under certain conditions, eleven of the companies reporting say that they do not believe that the new ruling will make them change the number of circuits permitted on two-wire service. Eight companies think a change will come as a result.

Practice with Inclosed Meter Switches. —Where inclosed meter-service switches with meter end walls or the equivalent are used on single-phase services, the main fuse or meter fuse is controlled and sealed by nineteen out of twenty-three companies. In most cases the so-called "safety switch" boxes are employed, a variety being in use. With such boxes, fifteen companies furnish the adapter or end wall.

Troughs or Nipples for Connecting Group Boxes.—Six companies use both troughs and conduit nipples, seven prefer nipples and two use troughs for connecting grouped or banked boxes.

Practically all of the companies require that the meters for subdivided buildings be installed in a common location if such location is reasonably accessible. For underground direct-current service in subdivided buildings, where there is no common basement or accessible meter room in a private basement, most of the companies prefer

locating all the meters on one board in one basement where they will be reasonably accessible. Otherwise they are installed in their respective subdivisions.

Switchboard Meters for Large Installations.—Practice is divided regarding the furnishing of switchboard-type meters for large power and lighting direct-current installations, three companies furnishing such meters, two companies furnishing them under certain conditions and four furnishing them under no conditions. Where these are furnished, they are usually placed on the customer's panel.

Fifteen companies do not furnish switchboard-type meters on 220-volt and 440-volt polyphase installations, two companies do and three do so under certain conditions.

Self-Contained and Shunted-Type Meters.—The majority of companies are in favor of self-contained meters, five favoring them, three using shunted-type meters and one company both. Where self-contained meters are used most companies employ test blocks, some use special-type test links, and one company uses jumpers below 100 amp. Where shunted-type meters are used, the shunts are mounted on the rear of the panel or on the wall where there is no panel. Two companies place them in the main buses and one on special cast-copper supports.

Largest Self-Contained Meters.—In all classes of service—namely, single-phase, direct-current or polyphase—companies differ considerably regarding the largest self-contained meter which should be used. In the single-phase class the 75-amp. and 150-amp. are predominant, each being used by seven to eight companies, 50-amp., 100-amp. and 600-amp. coming next in extent of usage. In the direct-current class the 300-amp. meters are used by more companies than the other sizes, which include 75-amp., 150-amp., 1,500-amp., 2,000-amp., 400-amp., 3,000-amp. and 6,000-amp., the order indicating about the extent to which they are used. Opinion was expressed in the committee meeting that by using shunted types of meters the company could get away from stray-field trouble and besides would have to stock fewer types of meters.

Testing Facilities for Self-Contained Meters.—Six companies do not provide any testing facilities for self-contained polyphase meters, but twelve do, testing blocks being in predominance, although flexible loops and test clips are used in two cases.

Test blocks are also favored for testing 220-volt and 440-volt current-transformer installations, eighteen companies providing these or the equivalent. In general, the companies require that the current transformers be inclosed in an iron box or cabinet.

Single Versus Paralleled Meters and Meters in Series.—Five companies use single rather than paralleled meters for measuring large blocks of power, one company paralleled meters and two companies both types. With one exception meters are never placed in series to facilitate testing or minimize the possibility of error. The one exception is in a government installation which was intended to have a 20,000-kw. load, but never reached the expected capacity.

440-Volt Versus 110-Volt Meters.—Nine companies favor 440-volt meters instead of 110-volt meters with potential transformers for 440-volt services, six companies favor the latter and three companies use both types. Among the reasons given for preferring 440-volt meters are the following: "Very satisfactory and cost less to install," and "Cheaper than where instrument transformers are used." The advocates of 110-volt meters with potential transformers favor them as protection against lightning and other surges, to avoid carrying a stock of 440-volt meters and special 440-volt testing equipment, for simplicity and safety, greater reliability and less sensitiveness to damage and because of small clearances in 440-volt meters.

Necessity of Oversize Meter Lugs on Large Installations.—Since the Underwriters' rules require service wires to be at least equal to the connected load, and since installations are metered according to the demand and not the connected load, the required meter loops are often too large to connect into the lugs of the meters. While expedients have been adopted to meet this situation, eleven out of sixteen companies express the belief that removable oversize lugs should be provided into which the meter loops can be soldered and then fastened to the meter terminals.

Five-Ampere Versus 10-Amp. Meters.—Thirteen companies report that 5-amp., 110-volt, two-wire meters are seriously overloaded at times in ordinary residence installations, although nine companies say they have no such trouble. As a result, the consensus of opinion is that the 10-amp., 110-volt, two-wire meter will supersede the 5-amp., 110-volt, two-wire meter, fifteen companies being in favor of it. Six do not believe it is necessary.

One company reported running some tests on 5-amp., 10-amp. and 15-amp. meters. While the 5-amp. meters were not seriously overloaded, the load is rapidly increasing, and the 10-amp. meter would provide for it with accuracy. If the 10-amp. meter is used more extensively, the company claims, doubtless it can be obtained at the same cost as the 5-amp. meter, but if the companies wait too long in replacing existing meters, the cost of the change-over will be very great.

The majority of companies maintain, furthermore, that the 10-amp., 110-volt, two-wire meter will be much more economical from the meterman's standpoint as regards installation, testing, etc., provided that its price can be made competitive with that of the 5-amp. meters. It is also the consensus of opinion that distribution conditions will be considerably improved, since it would be much easier to analyze unbalance of load.

Number of Fuses from Transformer to Consuming Device.—In large apartment installations twelve companies use transformer fuses, main-line fuses, meter-cabinet fuses and individual-circuit fuses between the transformer and consuming devices. From five to seven companies also use main-line branch fuses and main distribution fuses in addition to those named.

Opinion was expressed in the committee meeting that entirely too many fuses are required between transformers and consuming devices. For example, one company says that it does not require main distribution cabinet fuses and feels perfectly justified in omitting main branch fuses and distribution main fuses because there are already sufficient fuses in the circuit to take care of any possible trouble. Another company expresses the belief that fuses should protect the wiring and that this can be much smaller in the main branch-circuit mains than in transformer leads owing to a large diversity factor. This thought is amplified by another company, which says that it believes in fusing wherever the size wire is reduced, except in grounded conductors. In small 5-amp. to 10-amp. meter installations another company believes that fuses could be eliminated in the meter-circuit box.

Fusing 30 to 100-Amp. Meters.—Practice is varied on fusing meter switches, eleven companies fusing to the capacity of the switch, four companies to the capacity of the wire, an equal number to the magnitude of the connected load, and two for meter capacity. One company seems to express the requirements very clearly by saying the service switches are fused to the capacity of service, meter switches to the maximum safe capacity of the meters, and circuit fuses are selected to take care of circuit trouble.

UNDERGROUND DIRECT-CURRENT

Main Branch Fuses for Groups of Meters.—In apartment or mercantile buildings where a large number of meters are grouped on one meter board and arranged in several tiers the practice regarding the use of main branch fuses for each group or tier of meters in addition to the main-line fuse and fuse in the meter cabinet is divided—about eight companies requiring such main branch fuses and eight not doing so. Three other companies state that this requirement is conditional. For example, if the size of service wires is maintained to each bank or tier, no main branch fuses are necessary. If the size of the wire is reduced, it must be fused in a steel cabinet equipped for sealing.

Location of Apartment-House Fuses.—Divided opinion was expressed regarding the location of branch fuses for apartment houses. Some companies prefer all fuses on a central meter board to facilitate "trouble shooting" and permit inspection of branch fuses. Almost an equal number require that all such fuses be installed in the customer's apartment or in his hallway, or on the same floor, since it reduces the cost of installation."

Temporary Meter Installations.—For temporary power and lighting installations, such as for floor surfacing, carnivals, garden parties, construction jobs, etc., where there is no building suitable for meters, most of the companies use weatherproof boxes containing fuses and meters, these boxes to be mounted on the nearest pole or elsewhere. A few companies use portable meter boxes which are made up in advance and are available immediately for every temporary job.

Letters from Our Readers

A Place Set Apart for Suggestions, Comments and Criticisms, to Which All Men of the Electrical Industry Are Cordially Invited to Contribute

Professors of Engineering and Practicing Engineers

To the Editors of the ELECTRICAL WORLD:

In an editorial in your issue of June 14 you ask why it is that the voluntary co-operation between professors of engineering and practicing engineers is not so close as that between the teachers of physics and physicists retained by the industries. The reasons adduced for this apparent reflection upon teachers of engineering are that at a recent meeting of a physical society a large percentage of the papers presented were by teachers, and that in the recent publications of the American Institute of Electrical Engineers only a small proportion of all the papers presented emanated from professors of engineering. Permit me to comment upon these facts and upon the conclusion you have drawn.

In the active advance of all the technical arts in recent years industries have found themselves in greater and greater need of information lying on the outer boundaries of scientific knowledge. It is the avowed business of physicists and chemists to work in this realm of pure science and research. That is the prime reason for the existence of university laboratories, undergraduate instruction in these subjects being only a secondary purpose. Consequently, when large and powerful industries find themselves in need of information in the realm of pure science it is natural that they should draw into their organizations men trained in these advanced fields. Moreover, they ask these men to continue exactly the same character of study and investigation that they would have pursued had they remained in university laboratories. Consequently the apparent close relationship between university physicists and industrial physicists is merely a result of the fact that a man is a physicist in either position. Further, it is natural that the papers emanating from each class should find the same channels of publication and discussion.

But consider what proportion of the total need of the industries, in men, is represented by the pure scientists and the proportion represented by their demand for young engineers. The two figures are scarcely comparable, so much greater is the dependence of the industry upon the volume of the output of young men trained in the fundamentals of engineering practice. Take the matter a step further, and grant, as I freely do and earnestly advocate, that engineering faculties should contribute to the advance of knowledge in the fields of research and pure science; let us ask what fair proportion of their efforts may be devoted to this type of activity if they must also keep up the quality and quantity of the product of the undergraduate school. In other words, the sole business of professors of physics is to turn out investigators and other professors of physics. The first business of the engineering school is to turn out engineers, who are not necessarily scientists, in enormous quantities. The training of teachers and investigators unfortunately takes a very minor place, although even the most ardent advocate of scientific research for engineers would scarcely contend that any considerable number of men so trained are desirable.

Now as to actual co-operation between faculties of engineering and the industry. Not all industries can retain their own scientists, and a vast number of them turn to engineering schools for the solution of their scientific and technical problems. The record of this character of service is rarely published, yet we know that a number of engineering schools maintain definitely established methods for the handling of such work. In the school with which I am connected our records during the past two years show more than sixty instances in which we have rendered services of definite scientific character, much of it involving careful scientfic investigation. Next in order attention may be called to a number of instances in which professors of engineering are retained in consulting capacities by large interests. In a brief moment's thought I have been able to set down twelve such instances within a comparatively small radius of the country, and I am sure this list could be greatly extended. Finally, as regards original contributions and published papers by professors of engineering, here too one could easily point out a dozen names of those who have made and continue to make important contributions in the field of engineering. It is not necessary to enumerate them.

But in spite of these facts in defense of the professor of engineering, their recital does on the whole take on somewhat the nature of an apology. Engineering laboratories and faculties should undoubtedly take a more active part in investigation and research leading to advance in the state of the art. A limited number of professors are actually now taking a hand in such work —a small hand it is true, owing to the fact that in nearly every case they are overburdened with the requirements of undergraduate instruction and by limited appropriations for assistants and equipment. The number, however, is small, and your question is a perfectly proper one as regards the large number of professors who are content to discharge only their instructional duties. The explanation seems to me to be fairly clear. Large numbers of them have received no scientific training beyond the four-year undergraduate courses. It is a reproach to the body of teachers of engineering that they have not up to this time appreciated the importance of turning out greater numbers of men who have spent two or three years in the graduate field of engineering instruction leading to advanced degrees, not only to meet the industrial need, but for the strengthening of the profession of engineering teaching. They will perhaps be convinced of this if industry itself can be made to see the importance of stimulating the sources of production of men trained not only in pure but also in applied science. Obviously the most fruitful of these sources are university schools of engineering, conducting well-organized graduate courses by men of scientific training and in an atmosphere well saturated with the tradition and spirit of the importance of advanced training and of scientific research. Industry could readily furnish this stimulation. Two things would appear to be necessary— increased financial support for graduate faculties and the emphasis by industry of the importance of the advanced type of training. The money required would not be great, and, in my opinion, the thing now most necessary in this matter is the voice of industry.

Baltimore, Md. J. B. WHITEHEAD.

Central Station and Industrial Practice

Time Study in Meter Work Betters Service

By Fred H. Pumphrey
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A VERY successful method of time study has been used by the Dayton Power & Light Company in making an analysis of some of the meter department work. The particular work on which this study was based

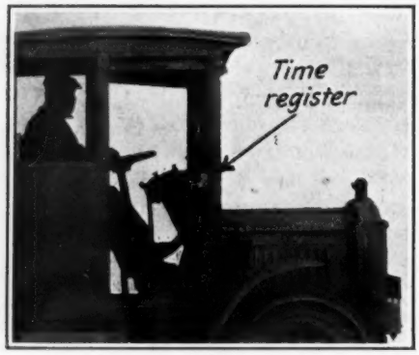


FIG. 1—TIME REGISTER INSTALLED IN METER TRUCK

was the meter service branch of the department, consisting of meter setting, removing, disconnecting, reconnecting and transferring. For two years there had been three men on this sort of work, completing in the neighborhood of fifteen to twenty-five orders per day, depending upon the nature of the orders to be handled. When work dropped off, it was found that the men would work as slowly as possible in order not to be idle, resulting in very low efficiency.

The three machines used by these men were then equipped with time registers so that a complete record could be kept of the work accomplished by each man. The method of installing this register on the truck is shown in Fig. 1, while a typical record is shown in Fig. 2. By means of these registers very complete and accurate records are available of each man's movements and what he accomplishes during the day from the time he leaves the garage in the morning until he returns at night.

By setting certain dials and turning a knob the driver registers the number of his stops, what he has been doing, the date, time and mileage at the moment of registration. Referring to Fig. 2, the odometer reading is on the left, the number of miles traveled being shown by the difference in the reading. Next is the character of work, designating what the man has been doing previous to the time of making the record of impression. On the right of this is a serial number giving an identification to each stop. The date and time are next followed by the number of the register and the identification number of the driver.

After installing these registers the inefficiency was so evident from the study that the force was reduced to two men, producing a saving of one-third in the cost of this type of work. It was found necessary to have the help of a third man occasionally on peak loads.

In order to make a comprehensive study data were collected over a period of several months. Then each division of work was studied individually, the results being shown in Table I. No time is included for getting to and from the job. The average driving time per call taken over a period of three months was found to be 7.7 minutes for Truck No. 2 and 7.2 minutes for Truck No. 1. The minimum weekly average for Truck No. 2 was 6.15 minutes and for Truck No. 1 5.6 minutes.

Mileage	Miscellaneous Data		Month	Day	A.M. or P.M. Hour	Minute	Auditor Number	Driver's Number
00194.7	UNLD	6	AUG	19	A	8	57	499
00194.7	TRIP	6	AUG	19	A	8	44	499
00193.3	UNLD	5	AUG	19	A	8	33	499
00193.3	TRIP	5	AUG	19	A	8	28	499
00193.1	UNLD	4	AUG	19	A	8	26	499
00193.1	TRIP	4	AUG	19	A	8	20	499
00192.2	UNLD	3	AUG	19	A	8	8	499
00192.2	TRIP	3	AUG	19	A	7	48	499
00191.5	UNLD	2	AUG	19	A	7	41	499
00191.5	TRIP	2	AUG	19	A	7	37	499
00191.0	LOAD	1	AUG	19	A	7	32	499
00191.0	TRIP	1	AUG	19	A	7	7	499
00190.0		0	AUG	19	A	6	58	499

FIG. 2—SAMPLE RECORD TAKEN FROM REGISTER

From these figures it was decided that six minutes was a reasonable and attainable goal toward which

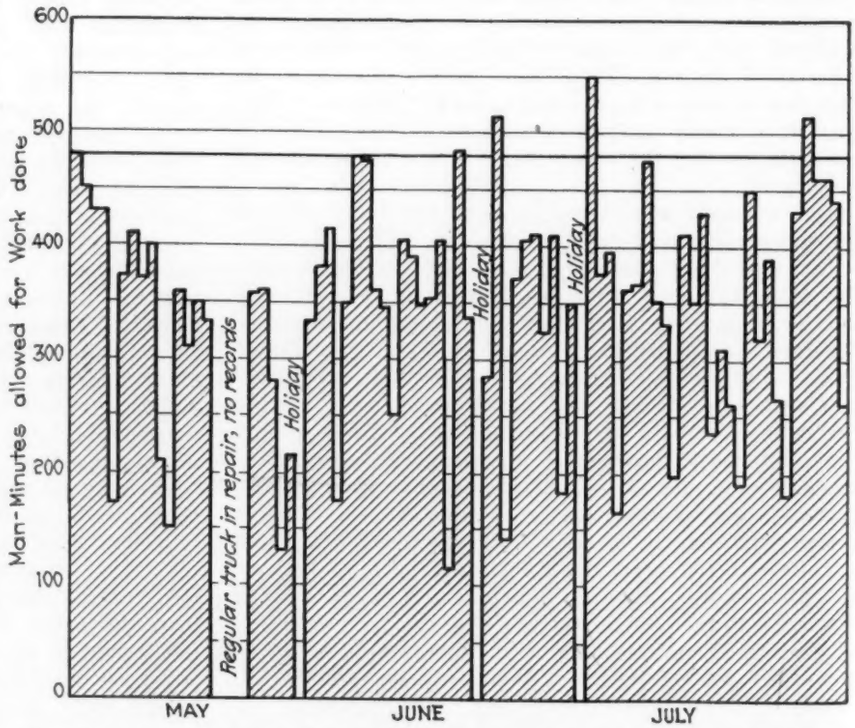


FIG. 3—WORK DONE BY METER SERVICE MAN OVER A PERIOD OF THREE MONTHS

TABLE I—INDIVIDUAL STUDIES OF METER DEPARTMENT WORK

Work Done	Truck No. 1 Number Completed	Truck No. 1 Total Time	Truck No. 1 Average Time	Truck No. 2 Number Completed	Truck No. 2 Total Time	Truck No. 2 Average Time
Sets	141	2,813	20.0	141	3,428	24.31
Set changes	26	621	23.8	14	283	20.21
Removals	21	234	11.1	20	215	10.70
Disconnects	417	2,581	6.2	514	4,069	7.90
Reconnects	438	2,456	5.6	452	3,393	7.50
Transfers	631	2,315	3.7	607	3,108	5.10
Not home	329	1,053	3.2	...	.....	.....

TABLE II—TIME IN MINUTES ALLOTTED FOR EACH JOB BASED ON STUDY MADE

	A	B
Sets	18	24
Set changes	18	24
Removals	8	14
Disconnects	5	11
Reconnects	5	11
Transfers	3	9
Not home	2.5	8.5

to strive. The first column of Table II gives what was thought to be a goal for net job times. Adding to these job times the six minutes allowed for driving to and from the job gives the figures in the second column. These figures are so made that they include none of the time for planning or routing the orders, and allowance must be made for this phase of the work. A typical example of the work done by one of the meter service men is shown in Fig. 3. In this figure Sundays are not included.

By means of some system of this kind department heads can keep in very close touch with the performance of their men. There is also a possibility here for paying on the bonus system, or the department head may only want to follow the trend of his work. By means of studies of this kind, standards against which results can be measured are available.

Overhead Distribution Construction

Standardized Practice as Developed and Used by the
WEST PENN POWER COMPANY, PITTSBURGH

Street-Lighting Circuit Construction

ALL line wire for series street-lighting circuits shall be of No. 6 medium hard-drawn copper. All drops to lamps shall be No. 8 flexible soft-drawn copper wire, except that twisted two-conductor wire supported on screw pins driven into the pole may be used on joint poles and in other cases where necessary to secure clearances from services or from foreign wires. In general, street-lighting line wires shall be installed on the end pins of the crossarm.

Glass insulators, Hemingray No. 20 or equivalent, shall be standard line insulators for all series street-lighting circuits. Porcelain strain insulators, Westinghouse No. 128,272 or equivalent, shall be used to break series lighting circuits at lamps and at loops.

A strain insulator shall be installed, as shown in Fig. 73, to break the circuit at each lamp. Drops to lamps shall be supported on bolt or screw pins and held taut. Standard construction at all branches and loops shall be as shown in Fig. 74.

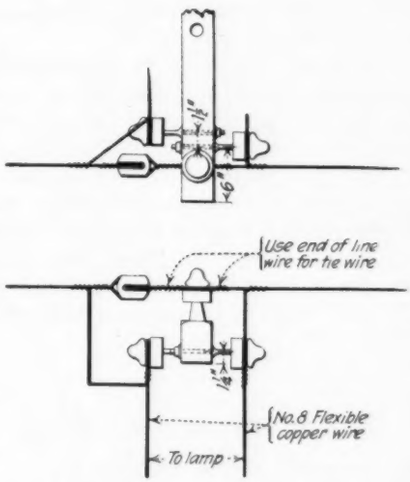


FIG. 73—INSTALLATION OF STRAIN INSULATORS IN SERIES CIRCUITS AT LAMPS

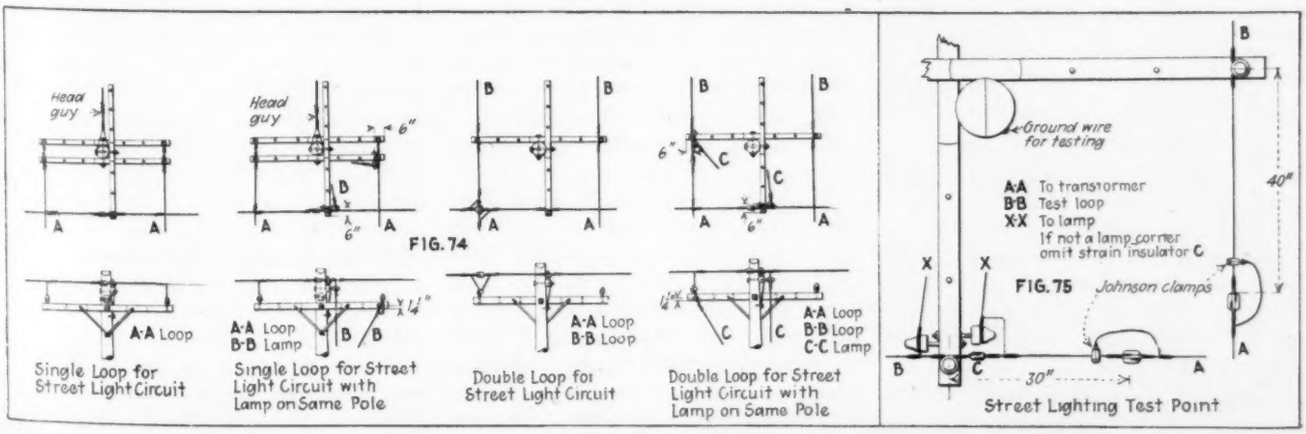
At points where extensive loops of a series circuit may be cut out for testing and locating trouble strain insulators shunted by jumpers equipped with standard clamps shall be installed as shown in Fig. 75. A ground wire for test purposes shall be installed at all such test points.

Cost of Installing Oxide-Film Arresters

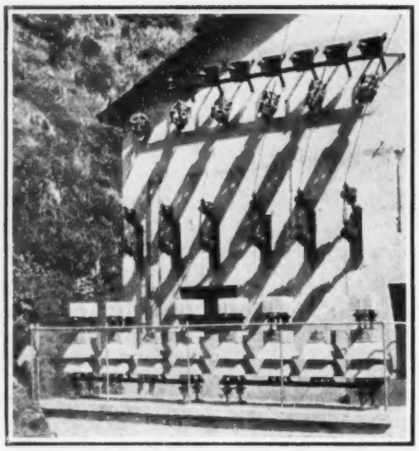
BY FREDERICK KRUG
Superintendent of Power Production, Porto Rico Railway, Light & Power Company, Bayamon, Porto Rico

RECENTLY the installation of outdoor-type oxide-film lightning arresters at two of its hydroelectric plants was completed by this company. These arresters replaced the older indoor multigap arresters, which, it was felt, did not offer sufficient protection to the plant equipment. In view of the limited space available in the power houses it was decided to use outdoor arresters, installing them as near as possible to the entrance of the duplicate 22,000-volt lines to the buildings.

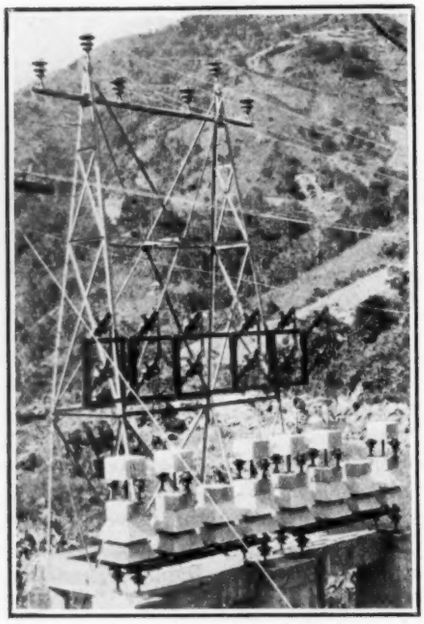
The design was made as compact and simple as it could be, in one case the most convenient location being against the building wall and in the other at the nearest tower to the building as shown in the accompanying illustrations.



FIGS. 74 AND 75—BRANCHES AND LOOPS IN SERIES CIRCUITS AND STREET LIGHTING TEST POINTS



TYPICAL INSTALLATION OF OXIDE-FILM ARRESTER



OXIDE-FILM LIGHTNING ARRESTERS INSTALLED AT FIRST TRANSMISSION TOWER

COST OF TWO OXIDE-FILM ARRESTER INSTALLATIONS

Material:	
Two sets of arresters	$1,490.00
Six choke coils	331.20
Six disconnecting switches	339.60
Concrete platform	99.38
Miscellaneous and freight	111.75
Labor:	
Assembly installation and connecting	81.08
Total	$2,513.01

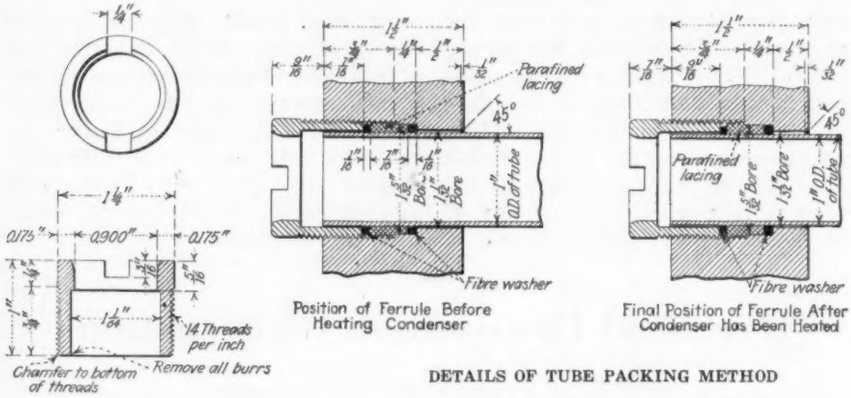
The arresters purchased are for 22,000-volt service, but were specially insulated for 50,000 volts in view of a possible increase of system voltage to 44,000 in the near future. The disconnecting switches are also rated at 50,000 volts. Suspension-type choke coils were used rated at 200 amp.

The cost of making each of the two installations illustrated is given in the accompanying table.

Typical Method of Packing Condenser Tubes

ONE method of packing condenser tubes used by an Eastern company is shown in the accompanying illustration. In this process the inner fiber washer is inserted, a 40-in. length lacing is wound around the tube, and then the outer fiber washer is inserted. After this the ferrule is screwed into place and pulled up tight, bringing the outer edge of the ferrule $\frac{5}{16}$ in. from the face of the tube plate as shown in the center drawing.

After all ferrules have been pulled up tight steam is admitted to the condenser, allowing the tube sheet gradually to warm up until a tallow candle will melt when held against it. Then all ferrules are pulled up tight again, bringing the outer edge of the ferrule $\frac{7}{16}$ in. from the face of the tube plate. It is important that all holes be tapped to a uniform depth of $\frac{3}{4}$ in.



DETAILS OF TUBE PACKING METHOD

Automatic Arc Welding of Iron Tanks

AN INCREASE in production of ten times the footage per hour and large cost savings were the result of the adoption of automatic arc welding by the Wayne Tank & Pump Company at Fort Wayne, Ind., in assembling underground gasoline tanks. Previous to the adoption of arc welding the tanks were welded by oxyacetylene gas.

These tanks are made from $\frac{1}{8}$-in. galvanized sheet iron cut in three sections, with the assembled tank having three seams each 120 deg. apart and 116 in. long. The circumference of each tank is 118 in. For the assembly of the tanks a General Electric automatic arc welder was installed, replacing the old gas process. This automatic machine consists of a framework for holding the tank in position and for carrying the automatic welding head and electrode supply. The joint to be welded is placed between two clamping bars and a backing-up bar. Along this seam travels the automatic welding head which feeds the electrode wire to the arc on the welding surface.

The procedure of welding is to tack each of the longitudinal seams at either end by acetylene, each of these two tack welds being approximately 3 in. long. The plates are placed about $\frac{1}{8}$-in. apart before tacking, but draw up tight when the gas tack is completed. Following this they are placed on the automatic forms and the arc is struck at one end and allowed to continue without breaking to the opposite end. Then the clamps are released and the tank is rotated one-third of its circumference to the next seam and the automatic head welds the next seam on its return. The clamps are again released and the tank rotated to the third or last seam, which is welded in the same manner as were the two previous seams.

By the old gas process the welding was done at a speed of 7 ft. per hour. With the automatic installation production has jumped to 75 per hour. The three longitudinal seams are completed in a total time of thirty-five minutes as against a total of three hours by the old gas process. Besides the time saving, another favorable factor is that the galvanizing on the inside of the tank adjacent to the weld is in good condition, whereas by using the oxyacetylene process approximately 1 in. of the galvanizing was burned away from either side of the weld on both the inside and outside of the tank. The money saving in operation was such that the entire cost of installation was paid for in the first two months of operation.

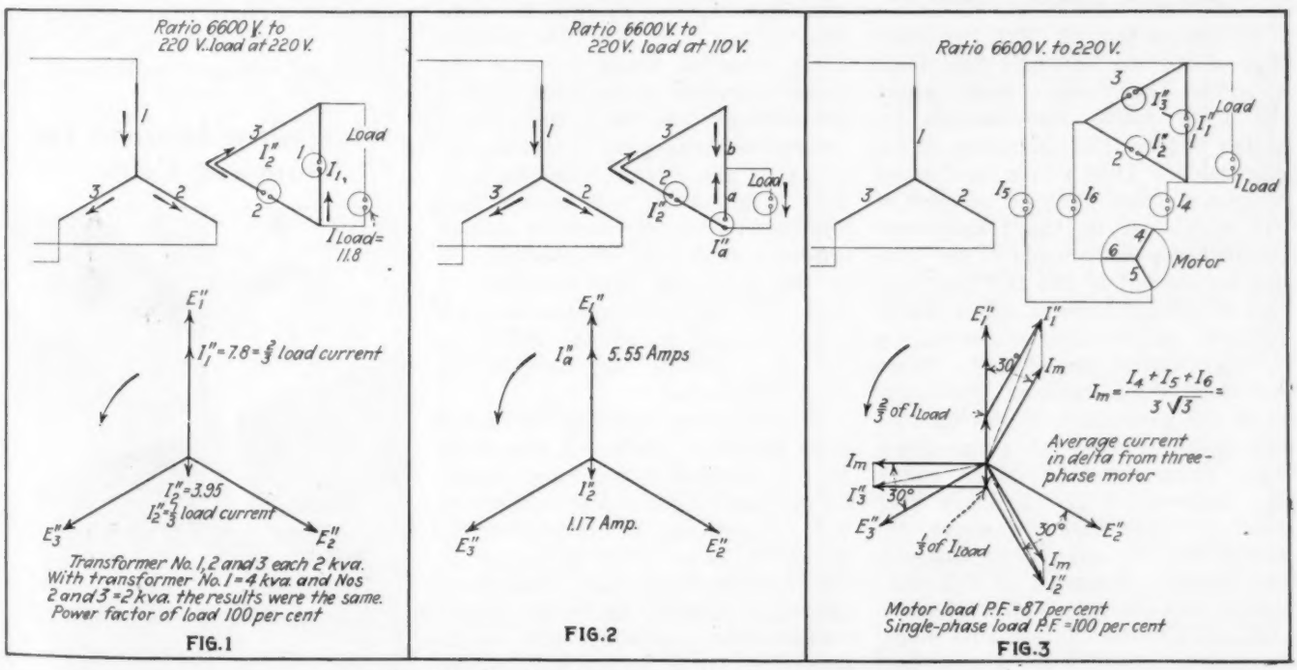
Service for Rural Districts

Single-Phase Service Taken from Three-Phase Power Banks—One Large and Two Small Transformers for Motor, Lighting, Heating and Cooking Loads

BY L. J. MOORE
Executive Engineer San Joaquin Light & Power Corporation, Fresno, Cal.

CAREFUL study has recently been given by the San Joaquin Light & Power Corporation to the proper sizes of transformers to be used where rural consumers desire both power and domestic service at locations close enough together to be served from one transformer bank. The company serves a large rural load in the San Joaquin Valley of California, and at the present time there is more than 63,000 hp. in three-phase motors connected. There is also a large amount of single-phase lighting, range and heating load in the rural districts. More than 5,400 rural customers use power, making the average size installation about 12 hp. The majority of the installations are 5 hp., 7½ hp. and 10 hp., and they are all in isolated locations, making it necessary to serve almost every one of them from individual transformer banks.

The distribution lines serving this load were originally 11,500-volt, three-phase, four-wire, with the neutral solidly grounded at the station and at occasional intervals along the lines. The distribution transformers serving three-phase power were rated at 6,600 volts on the primary side and connected star for 11,500 volts. The secondaries were connected in delta. Single-phase load was served by a single transformer connected between one phase wire and neutral, or in some cases by installing one transformer in the power bank larger than the others and taking the single-phase load from that side of the delta-connected secondary. Considerable trouble was experienced with the four-wire, three-phase system on account of numerous transformer burn-outs due to one primary fuse blowing and operation continuing on open star. The solution of this difficulty was finally found in the use of 6,600-volt transformers designed for 23,000 test voltage and the removal of the neutral wire and all primary neutral grounds on the distribution transformer banks. Single-phase loads were served by 11,500-volt transformers connected between line wires. One main consideration in deciding upon the use of a bank for the motors and an individual transformer for the single-phase load was that the rates for agricultural power in force at the time provided for summer use only. Motors in that service were sealed up during off-season months and fuses removed from the power transformers, but the transformer for lighting service was still left in service. In this way core losses were reduced in the winter months, and the three-phase, three-wire, 11,500-volt distribution


Ratio 6600 V. to 220 V. load at 220 V.
Load
I Load = 11.8
E1"
I1" = 7.8 = 2/3 load current
I2" = 3.95
I2" = 1/3 load current
E3"
E2"
Transformer No. 1, 2 and 3 each 2 kva. With transformer No. 1 = 4 kva. and Nos 2 and 3 = 2 kva. the results were the same. Power factor of load 100 per cent
FIG. 1
Ratio 6600 V. to 220 V. load at 110 V.
Load
Ia"
5.55 Amps
I2"
1.17 Amp.
E3"
E2"
FIG. 2
Ratio 6600 V. to 220 V.
Load
I Load
Motor
I4
I5
I6
E1"
I1"
Im = (I4 + I5 + I6) / 3√3 =
2/3 of I Load
Average current in delta from three-phase motor
1/3 of I Load
30°
Motor load P.F. = 87 per cent
Single-phase load P.F. = 100 per cent
FIG. 3

FIGS. 1 TO 3—METHODS OF SERVICING RURAL DISTRICTS

Fig. 1—$I_3'' = I_2''$ because series connections in delta transformers Nos. 2 and 3 have the same impedance, which would tend to make $I_2' = I_3' = I_1'/2$ in primary; but this holds even if impedances are different on account of delta secondary. As long as the primary neutral of stepdown bank is not grounded, changing size and impedances of the transformers in the bank will not change the current distribution for the same load. $I_2'' + I_1'' = I$ load. If power factor is less than 100 per cent, I_1'' will fall behind E_1'' by the angle whose cosine equals the power factor and I_2'' will of course be 180 deg. from the position of I_1''.

Fig. 2—$I_2'' = I_3''$ = current in unloaded side of transformer No. 1, because all are in series in low-tension delta. In primary side it is seen that $I_1' = I_2' + I_3'$. But $I_2' = I_3'$ because secondary currents are equal as noted above. Therefore $I_2' = I_3' = I_1'/2$ in primaries. Let r = ratio of full windings, primary to secondary. Let r' = ratio of full primary to one-half of secondary winding. Then

$$I_2''/r = I_2'/r = I_3''/r = I_3'/r = I_1'/2$$
$$I_1' = 2I_2''/r \qquad (1)$$

The resultant secondary current in transformer No. 1 = $I_a'' - I_b'' = I_a'' - I_2''$ and in effect flows in one-half of secondary only, because of auto-transformer action. Reducing from primary by ratio $I'r' = I''_{1R}$ = resultant secondary current in transformer No. 1. Substitute from equation (1):

$$I''_{1R} = (2I_2''/r)r' = I_a'' - I_2''.$$

From this:

$$I_a'' = I_2''(1 + 2r'/r).$$

But $r'/r = 2$; therefore $I_a'' = 5I_2''$.

Readings agree very closely with these calculations.

Fig. 3—This arrangement is simply a combination of a three-phase motor load, reasonably well balanced, and a single-phase load as in Fig. 1. Note that I_2'' is greater than I_3'' owing to phase rotation. With opposite phase rotation I_3'' would be greater than I_2''. The difference between the two currents I_2'' and I_3'' is so slight that no difference in transformer sizes is possible, and as the phase rotation is not always known, the safest plan is to use the value which is the highest and use transformers for both Nos. 2 and 3 which are sufficiently large for that.

The rotating motor aids in maintaining the voltage balance. From actual tests the following values were obtained: $I_1'' = 9.85$, $I_2'' = 9.3$, $I_3'' = 8.05$, $I_{load} = 3.35$, $I_4 = 14.08$, $I_5 = 13.4$ and $I_6 = 14.2$.

system came into use with 6,600-volt transformers and with neutrals grounded at substations only.

It is recognized that four-wire, three-phase distribution is in use in many cities and is operating with satisfactory results. In city distribution, however, transformer banks almost always serve a number of motors and the starting current of any one motor is usually not large enough to overload the transformers. In rural distribution, generally only one motor is served from a bank and fuses on the transformers large enough to provide for the motor-starting current afford no overload protection for the transformers. Therefore the motor and transformers might operate with one transformer fuse blown without the other fuses going out. In this manner open-star operation would result on the primary and an overload on the two transformers still in service sufficient to burn them up without blowing the fuses. Single-phase operation, however, is sufficient to blow the fuses.

SERVICING DOMESTIC LOAD

In the spring of 1921 the question of serving domestic load from a power transformer bank where the loads were close enough together to permit of this came up for discussion. This was a matter of serious moment, both on account of the high cost of the transformer installations being made at the time and on account of the fact that new rate schedules were in effect which required twelve months' service on the agricultural power load. There had been some question previously as to the possibility of serving considerable amounts of single-phase loads from star-delta banks where the neutrals of the primary star were not grounded. However, investigation on circulating currents and tertiary windings of Y-Y connected transformers had given a clue, and a series of tests were made, the results of which are summarized in the diagrams presented herewith.

It will be noted that no account has been taken of the magnetizing current in the transformers. In any event this would not show in the secondary currents which have been considered and would only be present in the primary. However, the absolute value of the magnetizing current is so small in comparison with the load currents involved that it is not of any serious consequence and would not require any change in the sizes of the transformer to be used. If readings were actually taken on the primary side of the transformer, some slight variations in current from the values shown in the formulas with the sketches accompanying this article would be found, but as already noted, the variations are due to the magnetizing current and are too small to warrant consideration as far as determining the size of transformers is concerned.

EFFECT OF COMBINING LOADS

It will be noted in Fig. 3 that the bulk of the single-phase current comes from the transformer directly across which the single-phase load is connected. The combination of motor current and single-phase current results in currents of different values in the other two transformers on account of the phase relations. It is quite possible, if the power factor of the motor current is sufficiently low, for the single-phase unity-power-factor load actually to cause a reduction of the amount of current in one transformer when a combination such as this is made. That is, the current will be reduced below what it would be with the motor operating on the bank. Which transformer will have the largest current depends upon the phase rotation in the circuit. Inasmuch as this is generally not known, and also because transformers of enough different sizes are not available, it is the policy of this company to make two of the transformers the same size and install the third one enough larger to take care of the single-phase load.

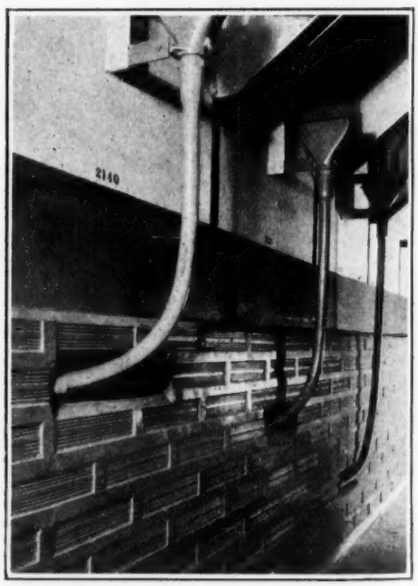
In view of the information gained from the tests conducted, the entire list of standard transformer installations was refigured and new standards were set up. At first a diversity factor of 50 per cent was used on the domestic load, and it was then figured as coming on to the transformers when the power load was in operation. It is necessary to figure the domestic load as coinciding with the motor load, because almost all of the power installations consist of a single three-phase motor and, therefore, the power load is either all on or all off.

A table of transformer installations was made up and put into effect. Experience has shown, however, that the diversity factor is even less than figured, and on account of the fact that the domestic load is so intermittent, it is found that smaller transformers than originally figured can be used.

The problem is simpler where the single-phase domestic load is served from two corners of the delta and wherever single-phase motors are used. The electric ranges are three-wire, 110/220 volts, and therefore practically operate across the delta the same as do the various heating devices. It is standard practice for the lighting to be served at 110 volts, two-wire, because the houses are generally small, and it does not seem to be justifiable to require the consumer to wire his house three-wire for lighting only.

It is well to remember in such installations that it is not possible to bank together transformers of too great a difference in size. For instance, if two 5-kva. transformers were banked together with one 25-kva. transformer connected star-delta with the star isolated from the ground it would undoubtedly cause trouble. If the 25-kva. transformer were loaded up with a single-phase load, the coils of the two 5-kva. transformers would be overloaded sufficiently to burn them out, and the neutral would shift so much that unbalanced voltages would result.

Flexibility Attained for Outgoing Cables



THE method shown in the accompanying illustration for bringing 13,000-volt three-conductor cables out of substations has been found to be very satisfactory according to the experiences of the Philadelphia Electric Company. Complete flexibility and maximum insurance to service result from this arrangement.

Central Station Business

Central Hudson Company's Co-operative Better-Home-Lighting Campaign

How One Central-Station Company Has Helped Organize the Local Electrical Leagues and Is Carrying Out the Program as Originally Scheduled

TO TAKE full advantage of the nation-wide "better-home-lighting" activity under the general direction of the Lighting Educational Committee, the Central Hudson Gas & Electric Company, with headquarters at Poughkeepsie, N. Y., has drawn up a definite plan of procedure for the local electrical interests. This plan has been put in operation, and the form of organization is particularly interesting as a typical example showing how the local campaign ties in with the plan of the national committee.

Through its sales promotion department the company is co-operating with the Hudson Valley Electrical League in the promotion and operation of the better-home-lighting movement through the appointment of a regional lighting educational committee to supervise this campaign. The Hudson Valley Electrical League, which is composed of local electrical leagues representing the cities of Beacon, Newburgh, Poughkeepsie, Kingston and Catskill, all served by the Central Hudson system, has drawn up a plan for each local league and is conducting the operation through an especially appointed lighting educational committee of the local electrical league.

Organization.—The committee in charge of this activity for the Central Hudson region includes a representative of the Central Hudson system to act as chairman, the chairmen of the local electrical league committees and the branch commercial managers of the various companies co-operating in the movement. A committee known as the local electrical league lighting educational committee is in charge of the local better-home-lighting activity and includes the central-station commercial manager to act as chairman of the committee, the superintendent of schools, the president of the board of education, a representative of the electrical league and the president of the women's club.

Finance.—The campaign is being financed at the rate of 17 cents per residence meter in cities taking part in the movement. Of this sum 12 cents per residence meter is appropriated by the Central Hudson system and 5 cents per meter by the local electrical league.

Period of Contest.—The local campaign will extend over a period of thirty days, allowing ten days for preliminary promotional work and publicity. The plan should be ready for operation on September 15, 1924.

School Relations.—The plan has been outlined to the superintendent of schools, and the approval of the board of education was obtained prior to the close of school in June for the summer months. Permission to distribute announcements, registration cards and home-lighting primers have also been obtained.

Prizes.—The prizes will be selected by the committee and will be merchandise of the type that has the greatest appeal to school children.

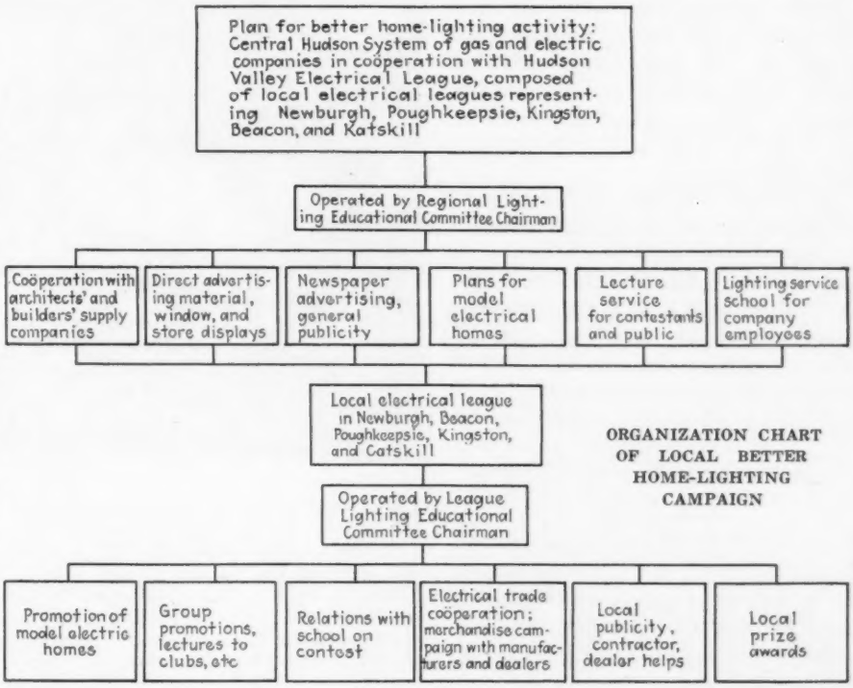
Prizes	Value Boys'	Value Girls'	Total
First	$50	$50	$100
Second	25	25	50
Third	15	15	03
Fourth	10	10	20
Next ten	5	5	100
Total	$150	$150	$300

Judges.—The persons selected for the judges for the local contest include the superintendent of schools, president of women's club, president of parents and teachers' association, president of board of education, editors of local newspapers and central-station representatives.

So that there will be no question as to the cost of the campaign, a local budget for each community has been prepared. This totals $850 and is made up of the following items:

5,000 announcements and registration cards	$50
4,000 primers, at 5 cents each	200
Posters and window displays	25
Badges and buttons	50
Newspaper advertisements	175
Prizes	300
Miscellaneous	50
Total	$850

In the actual work of conducting the campaign the service which is furnished through the Society for


Plan for better home-lighting activity: Central Hudson System of gas and electric companies in coöperation with Hudson Valley Electrical League, composed of local electrical leagues representing Newburgh, Poughkeepsie, Kingston, Beacon, and Katskill
Operated by Regional Lighting Educational Committee Chairman
Coöperation with architects' and builders' supply companies
Direct advertising material, window, and store displays
Newspaper advertising, general publicity
Plans for model electrical homes
Lecture service for contestants and public
Lighting service school for company employees
Local electrical league in Newburgh, Beacon, Poughkeepsie, Kingston, and Catskill
Operated by League Lighting Educational Committee Chairman
Promotion of model electric homes
Group promotions, lectures to clubs, etc
Relations with school on contest
Electrical trade coöperation; merchandise campaign with manufacturers and dealers
Local publicity, contractor, dealer helps
Local prize awards

ORGANIZATION CHART OF LOCAL BETTER HOME-LIGHTING CAMPAIGN

TIME SCHEDULE FOR CENTRAL HUDSON ON BETTER HOME LIGHTING ACTIVITY

June 1.—Release of tentative plan with dummies and preliminary copy by national Lighting Educational Committee.
June 10.—Approval from management of Central Hudson system, together with appropriation for local campaigns in Beacon, Newburgh, Poughkeepsie, Kingston and Catskill.
June 16.—Conference of commercial managers at Poughkeepsie on better-home-lighting plan.
June 19.—School relations committee to secure co-operation of school authorities in communities where campaigns are to be run.
July 1.—Complete preliminary negotiations for local campaigns and the order of all material from the national Lighting Educational Committee.
July 7.—Conference in New York with national Lighting Educational Committee and field staff on Central Hudson plan.
July 8.—Conference in New York with manufacturers for follow-up plan for the better-home-lighting campaign.
July 14.—Preparation of campaign manual and set-up of material to be used in the local campaigns.
July 20.—Organization conference of Central Hudson system; also release of campaign manuals to the members of the various committees.
August 1.—Production of material in the sales promotion department.
August 4.—Preliminary field work for the local committees.
August 11.—Distribution of advertising helps for the local committees.
August 18.—Construction and erection of exhibits with the local committees.
August 25.—Conference at Poughkeepsie of all local committees for the purpose of completing all preliminary arrangements prior to the release of preliminary publicity on September 1.
September 1.—Advertising material released.
September 15.—Contest starts.
October 15.—Contest closes.
October 25.—Opening of local electrical home.
October and November.—House-wiring campaign.
Last three weeks of November.—Co-operative portable-lamp campaign and kitchen-lighting campaign, with special efforts on refixturing plans through local contractor-dealers.

Electrical Development will be used practically in its entirety. The Central Hudson plan thus includes the home-lighting primer, newspaper publicity and lessons, badges for contestants, newspaper advertising, motion pictures, radio broadcasting, home service demonstrations, lectures, co-operation with manufacturers, window and store displays, an electrical home and a house-wiring campaign.

The time schedule for the Central Hudson plan from its start on June 1 to completion on December 1 is shown here. Up to this time (the middle of July) the schedule has been adhered to, and R. J. Canniff, who represents the Central Hudson company in the campaign, expects to start active work on September 1.

Free Fan Service for the Sick

IN ACCORDANCE with its practice during many years, the Oklahoma Gas & Electric Company will provide free electric fan service for sick persons who are unable to pay for it. All that is necessary to obtain this service is for the attending physician to supply the name and address of the patient and certify that fan service is needed and the sufferer is unable to pay for it. Officials of the electric company assert that scores of letters commenting upon the good accomplished have been received from physicians and patients who have received this service in towns in which the company operates and that for this reason the practice will be continued.

Rural Street Lighting

Formation of Districts and Negotiation of Contracts Aids in Extending Lines Into Countryside

BY ESTABLISHING rural lighting districts and contracting for street lighting within these districts the Livingston Niagara Power Company of Avon, N. Y., has developed what it considers a very satisfactory method of extending its lines into rural territory outside of cities and incorporated villages. Such lighting districts, however, should not be formed unless a substantial street-lighting contract can be obtained, according to John M. Costello, general manager, who before the recent Commercial Section meeting of the Empire State Gas and Electric Association in Niagara Falls outlined his company's method of negotiating this business.

When a new lighting district is being considered, it is the company's practice to call on the supervisor of the town in which the district is to be formed and go into detail with him as to just what is to be done and just what territory is to be included in the district. In many cases it will find that he can be of material help in giving details which would not be obtainable otherwise. Most supervisors are good politicians, and if they find that certain parts of the town are to be benefited by the district and that the voters are in favor of the district, it is an easy matter to get them to "boost" the proposal and see that it has the proper consideration when it comes before the town board. The same holds true with the other members of the town board, but almost always some one member of the board is against any proposal of this nature.

In many cases a personal talk will change his attitude so that he will understand and vote for the plan when it comes up for consideration. I recall one member of a certain town board who was dead set against

Combining Waiting Station with Appliance Display

BY MEANS of a metal gate which can be locked at night across the entrance to the Waterville (Me.) electric shop of the Central Maine Power Company, local trolley passengers waiting for cars inside the vestibule of the store can view the attractive appliance exhibit of the central-station organization. A comfortable seat inside the outer door is provided for passengers, and during sales campaigns much popular interest has been aroused by the proximity of the exhibits and the waiting-room space. When the store is open there is of course a still better view of the appliance display.

rural street lighting, and it was necessary to talk to him long and loud before he was convinced that it was the proper thing. There are several districts in this particular town, and when the petition came up for the establishment of the district he always said that he was against the districts personally but he would vote for their establishment because the young fellow from the power company said the people wanted it and he was elected to give the people what they wanted.

When the boundaries of the district have been decided upon it is necessary to prepare the petition and map. The petition, of course, is to the town board and requests it to establish a lighting district in that part of the town described by metes and bounds and also by map. This petition is prepared by the power company so that it will be correct in all details.

Preparation of Petition

The circulating of the petition is very important work and should be handled by some one familiar with the public utility business so that he will be able to answer the numerous questions that are asked. He must have a good personality and be a judge of human nature. In other words, he must be a first-class salesman. We have our solicitor obtain the right-of-way and also a signed service application. This saves the consumer a trip to the office to apply for service after the district has been established and the service line is a reality. It is a great saving to some farmer that lives many miles from the office, and as soon as the underwriters' card has been received the order for the service can be made out.

Before the petition is circulated it is necessary to obtain from the assessors a list of the property owners in the proposed district and the assessed valuation of their property. With this information you will be able to answer the first question invariably asked, "How much is it going to cost me?" In answering this information it is best to tell them how much it will cost them for each $1,000 that the town board spends rather than tell them what the tax will be.

It is necessary to obtain 50 per cent of the taxpayers' signatures before the petition can be filed with the town clerk, and it is advisable to obtain a few additional signatures so there will be no question as to having a sufficient number. It is necessary to have each signature witnessed, and the witness signs an affidavit that he did witness the signatures on the petition. In case of having different persons circulate the petition it is necessary for both to make such an affidavit.

After the petition has been properly signed by the correct number of taxpayers it is necessary to obtain an affidavit of some member of the board of assessors of the town stating that the petition has been signed by a majority of the taxpayers of the proposed lighting district as shown on the latest assessment roll.

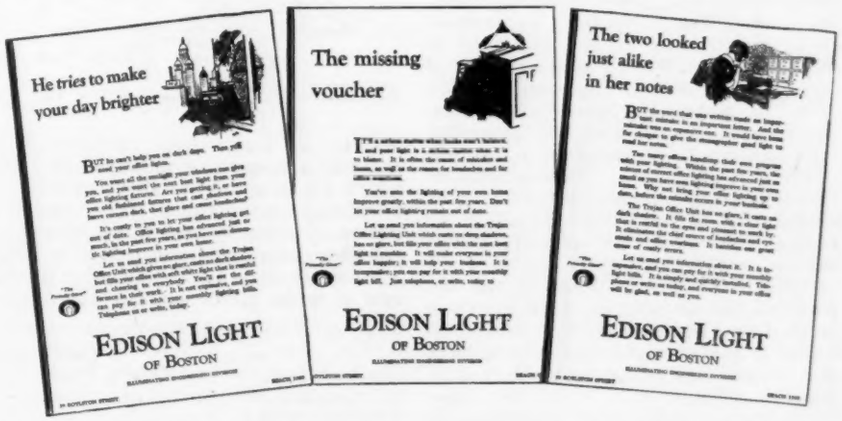
The petition is then given to the town clerk and a meeting of the town board is arranged for as soon as possible. At the meeting of the town board the petition is presented and a resolution passed by the board stating that a petition has been presented and that a meeting will be held on a certain date, at least thirty days after this meeting, to act upon the petition. The law requires that a copy of this resolution be published in the local paper and posted in at least six public and conspicuous places within the proposed district. We find it best to have all resolutions and notices prepared and see that they are properly posted and published. This is, of course, the duty of the town clerk, but as he might overlook the matter, it is best to have the actual work done by some one from the company. At the public meeting there is likely to be opposition from a few people, and it is best to have some one at the meeting who can explain any details.

The district having been properly established, the next and really most important thing is to obtain a street-lighting contract. It is our practice to have this matter all thrashed out with the town board before the district is formed. The number and locations of the lamps have been decided upon, and after the lighting district has been formed the contract can be executed.

In obtaining a street lighting contract it is best not to argue too much for all the lamps the district will stand, as we find that after the first lamps have been installed it is an easy matter to obtain more or larger lamps, provided the service is good and the lamps properly installed. Rural street lighting is a paying proposition if the lamps are not spread too far apart and are not of too small candlepower. Nothing will discourage rural lighting more than small lamps installed so far apart that they are of no benefit to the community.

Economic Appeal of Better Office Lighting

DURING the past three months the Edison Electric Illuminating Company of Boston has been carrying an effective series of office lighting advertisements in the local press, the displays being characterized by unusual human interest combined with an appeal to the economic aspects of poor illumination. Several of these advertisements are reproduced herewith. In general each discusses but one phase of office lighting at a time, avoiding lengthy dissertations and technical phraseology. Better lighting from the angles of reduced overtime, decreased delays from mislaid papers, lessened mistakes in transcribing notes, improved health of employees and greater flexibility of desk and table locations in assigning office furniture to convenient places of service are all touched upon in this series.


He tries to make your day brighter
EDISON LIGHT OF BOSTON
The missing voucher
EDISON LIGHT OF BOSTON
The two looked just alike in her notes
EDISON LIGHT OF BOSTON

ADVERTISEMENTS SHOW PRACTICAL ADVANTAGES OF GOOD ILLUMINATION

Digest of Electrical Literature

Including Brief Abstracts of and References to
Important Articles Appearing in the Scientific and Engineering Press
from All Parts of the World

Photostat copies or English translations of complete articles will be furnished at cost upon request

Hydro-Electric Development and Steam Equipment

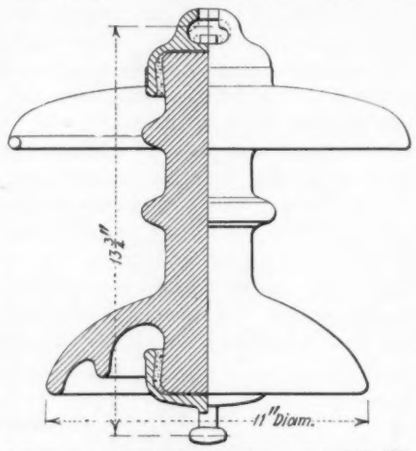
Power Developments on St. Maurice River.—L. H. BURPEE.—Existing hydro-electric plants on the St. Maurice River in Canada at present produce 450,000 hp. A new development at La Gabelle will increase this by 150,000 hp. Power-house construction details are described. —*Canadian Engineer,* May 27, 1924.

Ground Firebrick for Furnace Repair.—J. HARRINGTON.—Results from experiences with a special bond made principally from old firebrick for laying new walls and of a mortar for facing or patching are given. Thick joints of this bond show a saving of 35 per cent over the thin-cement joint construction. The article also discusses the monolithic method of furnace repair.—*Power,* June 17, 1924.

Hydro-Electric Power Station at Partenstein, Austria.—A. KVETENSKY. —Located on the 110-kv. line between the two cities of Linz and Vienna, the recently completed Partenstein station has a number of noteworthy features. Designed and provided for an ultimate capacity of 37,500 hp., there are now in operation two power units of 12,500 hp. each. The horizontal waterwheel is of the Francis type and runs at 600 r.p.m. under a useful head of 155 m. At full load the wheel uses 7½ cu.m. of water per second. Between the turbine runner and the umbrella-type generator is interposed a vertical shaft of 55-ft. length. The main 30-in. thrust bearing is placed below the generator and it can support safely 60 tons at full speed. The directly driven generator develops 12,000 kva. at 5,500 volts and 50 cycles. Each of the ten poles of the armature is held with one large dovetail within the five chromium-nickel plates of which its body is built up. Power is stepped up to the transmission voltage of 115 kv. by three three-phase, 12,000-kva. transformers, one of which serves as a spare unit. They are installed outdoors and contain electric heating units to prevent their oil from freezing. All switching apparatus, both the high voltage and the low voltage, were installed indoors in a separate switch house. No oil switches are placed between generators and transformers, each generator being connected directly to its transformer. However, a transfer bus with proper disconnecting switches allows either of the generators to be connected to any one of the transformers. Voltage regulation is obtained by compressed-oil operated shunt-resistance switches, depending upon the position of a voltage-controlled oil-admission valve. Steel-aluminum wires of 35 sq.mm. iron and 60 sq.mm. aluminum are used for the double-circuit three-phase line. All high-voltage bushings within the station are of the condenser type with metallic bands used for measuring purposes.—*Elektrotechnik und Maschinenbau,* May 18, 1924.

Transmission, Substations and Distribution

Suspension Insulators.—M. F. DAHL. —Very high mechanical strength and excellent electrical properties are the two chief requirements imposed upon insulators for safe operation of high-voltage lines. If to these two features can be added a minimum length for the insulator, the most desirable type will



SUSPENSION-TYPE INSULATORS FOR 110 KV.

result. A Swiss firm has developed recently a suspension-unit insulator for which all three of the above mentioned advantages are claimed. The insulator differs in shape considerably from any existing design and consists of a long, solid shaft with a bell at its lower end and a wide metal bell at the upper end. The insulator itself is made from one piece, void of any cemented joints. At the conical top and bottom ends are fastened metal armatures equipped for ball-and-socket interlinking of the individual units. These armatures are held to the insulator by a special metal alloy of a high mechanical flow point. For a 110-kv. line the new insulator gives the shortest over-all length when compared with other type. —*Elektrotechnik und Maschinenbau,* June 8, 1924.

Insulator Type	Locke	Hewlett	Ohio Brass	New Type
Number of units...	8	8	8	3
Electric safety factor.....	2.2	1.80	2.19	2.07
Length, mm.....	1,355	1,200	1,180	1,070

Generation, Control, Switching and Protection

Protection of Supply Networks.—W. WILSON.—The extensive size to which power networks have grown necessitate a very reliable system of protection. A critical discussion of a balanced protection system, known as the "McColl," is included in this article. This method depends upon the balancing or comparing of currents in two or more different parts of an installation. The principle is that when everything is in order the currents between which the balance is established are either equal or are in a fixed ratio to each other. A leakage disturbs this balance and operates the relays, thus tripping the switchgear. The application of this system to generators, transformers and feeder networks is given. —*Electrician (England),* May 23, 1924.

Surface-Condenser Operation. — A. PAGE.—The author has made an investigation with particular reference to the efficiency of surface condensers. The main problem encountered was the measurement of the outlet and inlet temperatures of any section of the condenser tube while the condenser was in operation. An apparatus was devised to measure these steam temperatures. It consisted of a special condenser door through which a thermocouple element connected to a mirror galvonometer could be maneuvered over any part of the tube plate.—*Electrical Times (England),* June 19, 1924.

Units, Measurements and Instruments

Testing Steam Turbine and Barometric Condenser.—F. S. YOUTSEY.— When testing a barometric or jet condenser the amount of steam used can be determined by a stream-flow meter or by some method in which the heat in the steam is measured. The steam-flow meter gives approximate values only, which are not sufficiently accurate to satisfy test conditions. As the writer was unable to find a method whereby a sample of steam could be withdrawn from a condenser at 28-in. vacuum and the quality determined, he devised a system for accomplishing this result which is particularly adapted to determining the performance of turbines and condensers.—*Power,* June 17, 1924.

Three-Phase Balanced-Load Wattmeters.—G. W. STUBBINGS.—Methods of measuring power or energy in so-called balanced three-phase circuits have frequently been condemned on the ground that in practice three-phase circuits are never perfectly balanced. The single wattmeter method is, however, of considerable use for circuits supplying three-phase motors in which the degree of unbalance is small and where the highest accuracy is not essential. Indicating wattmeters for switchboard use and energy meters in sub-circuits for allocating power charges can usually be of the balanced-load type. The case of the supply meters is perhaps different in that no avoidable source of inaccuracy should be allowed in an instrument upon the registrations of which the charge to a consumer is based. The paper goes into the probable amount of inaccuracy involved in the use of a single-element wattmeter when the unbalance of the circuit is small and also compares the performances of the various types of such meters that are available.—*Electrician (England),* June 6, 1924.

Specifications for Radio-Frequency Indicator.—Some time ago the bureau issued specifications covering a radio-frequency indicator for use by transmission stations. An improved type of indicator, known as type B, has been developed and specifications for its construction have been prepared. They give details for constructing the device for any frequency in the broadcast range.—*Technical News Bulletin No. 86 of the Bureau of Standards.*

Illumination

Lighting for Hotels and Restaurants.—A. S. TURNER and A. D. BELL—The lighting requirements of different parts of a hotel vary, but in every instance suitable illumination should be furnished and thought should be given to the uses for which the illumination of any part of the hotel is intended. In the service sections utility is essential, and high levels facilitate speed, accuracy and cleanliness. Elsewhere striking effects have direct advertising and attracting power, while in other parts artistic decoration should be the predominant motive. There are three main sections of a hotel to consider: First, those parts which are open to the general public, such as lobby, lounge and dining room; second, the guest rooms; third, the kitchen. The lighting requirements of each of these is detailed. —*Bulletin L. D. 151 of the Edison Lamp Works.*

Code of Lighting Factories and Other Workplaces.—A code is given for lighting factories, mills, etc., as prepared by the Illuminating Engineering Society. The code is intended as a guide for factory owners and operators in their efforts to improve lighting conditions in their factories. It is divided into three parts, the first containing rules arranged in convenient form for legal enactment or governmental regulations; second, a discussion of the rules of the first section, and, third, a consideration of the advantages of proper and adequate illumination, both natural and artificial, particularly from the standpoint of economics.—*Bulletin No. 331 of the United States Bureau of Labor Statistics.*

Motors and Control

Clutch Pulley for Induction Motors.—G. LEBAUPIN.—The more general use of squirrel-cage armature induction motors is limited by the rather small starting torque and the high reactive starting current. A French firm has developed a pulley for these motors which enables the motor to start idle and gradually to take hold of its load. The pulley is cast hollow, its two inner sides being slightly wedge-shaped. Within the pulley are lodged and properly guided six sector-shaped blocks, the sides of which are also wedged. The entire internal compartment of the pulley is oil-filled, with tightly fitting retaining rings on one side. When at rest the blocks remain nearest to the shaft, so that there is no mechanical connection between the shell of the pulley and the motor shaft. With increasing speed of the motor the blocks are forced outward, wedging themselves more and more into the shell casting, until the force is sufficient to pull the load of the motor. When the motor is stopped, these blocks fall back again, disengaging the pulley from the shaft. A number of oscillographs and operating curves illustrate the performance of this clutch pulley. It has been tried out successfully on motors rated up to 35 hp.—*Revue Générale de l'Electricité,* June 7, 1924.

Electricity in a Salt-Mining Plant.—A. B. PARSONS.—Electrically operated apparatus has played a very important part in the model salt-mining plant at Retsof, N. Y. It is the largest installation of its kind in the world. The equipment used is much the same as that in mining and milling metals and other non-metal ores.—*Engineering and Mining Journal-Press,* June 21, 1924.

Heat Applications and Material Handling

Electric Immersion Heater.—R. NAUJOKS.—After investigating the electric and caloric efficiency of a great variety of existing electric cooking appliances, such as hot plates, band heaters, pots with inbuilt units, etc., the author comes to the conclusion that none of these types approaches in efficiency the immersion-type heater. However, the available models of immersion heaters have a number of disadvantages which have prevented so far their more general use. In heaters of this type the heating element is built into a cylindrical shell made of solid German silver. It is considered poor practice to make the outer shell of an immersion heater of nickel-plated brass. A formation of scale is unavoidable on such heaters, and to remove this scale requires rather strong cleansing material, which soon destroys the nickel-plating, exposing the brass. The unit carries on its vertical stem an arrangement of various-size covers, nested concentrically into each other, so as to fit a number of pots. To prevent burning out when accidentally running dry, a small thermostat is placed within the heating unit and opens a snap switch before any harm has been done. After cooling, the heater is again ready to operate by closing the switch.—*Elektrotechnische Zeitschrift,* June 5, 1924.

Electric Heating in Industry.—J. H. CROSSLEY.—Electric heating, when properly applied, will result in much greater production, reduced labor costs, improved quality and the elimination to a large extent of rejections. All of these advantages will reduce the over-all cost of production, as is shown by the rapidly increasing number of industrial heating applications. The author points out a number of very profitable applications, such as oven heaters, ovens for enameling stoves, etc.—*Electrical Times (England),* June 19, 1924.

Traction

Railway Electrification Progress in Switzerland.—A. ROHN.—Electrification of the Swiss Federal Railways is in full progress. Two factors contribute to expediting this movement—the excessive coal prices prevailing toward the end of the war and the great lack of employment which dictated the execution of public works as emergency enterprises. A short decription is given of the 400 km. of the Federal lines now operating by electric power. During the next four years 1,150 km. will be electrified.—*Engineering News-Record,* July 3, 1924.

Locomotives for the Riksgränsen Railroad in Sweden.—S. HALDEN.—At the present time the Riksgränsen Railroad transports 5,000,000 tons of ore per year from the mines in Kiruna and Gellivare to Lulea in Sweden and Narwik in Norway. The present addition to the equipment will enable this electrified railroad to handle twice that amount. In order to utilize the single-track arrangement to full capacity it is necessary to use heavy trains. Consequently it has been customary to have trains made up of forty cars, each carrying 36 tons of ore and pulled by two locomotives. With the new locomotives it will be possible to handle the same trains with one locomotive. This railroad is operated by single-phase current of 16,000 volts and 16⅔ cycles. The new locomotives are built in double units of the axle arrangement 1C + C1. Each locomotive half has three drivers, rotated by side rods from a jack shaft, driven by a set of twin motors. The total continuous rating of the four motors is 2,200-hp. The tractive effort is 12.6 tons at 45 km. per hour with a maximum value of 26 tons. The article gives a complete description of the most important of the mechanical and electrical parts of the new locomotives. —*Teknisk Tidskrift (Sweden), Elektroteknik,* June 7, 1924.

Telegraphy, Telephony, Radio and Signals

Experimental Determination of Fundamental Dynamic Characteristics of a Triode.—E. TAKAGISHI.—The author has conducted several experiments for measuring fundamental components of electrical current in a triode under similar conditions to those met in practice. By picking up fundamental components only from the distorted current in a triode while functioning, the writer has first found new forms of dynamic characteristics for a triode, and these may be utilized for solving various problems not yet satisfactorily met such as modulation in radio telephony, phenomenon of "Ziehen," etc. He has also studied the voltage amplification factor with the result that a new constant was found.—*Research No. 133 of the Electrotechnical Laboratory, Tokyo, Japan.*

Some Methods of Testing Radio Receiving Sets.—The paper describes methods of measuring the electrical characteristics of a radio receiving set and tells of things which may be learned by an inspection of the electrical and mechanical design of a set. In developing the test methods described it has been the bureau's aim to provide means for determining to what extent a receiving set embodies the following characteristics: sensitiveness, selectivity, convenience of operation, effectiveness in covering the range of frequencies used commercially, and construction. Data on twenty-eight sets made by fifteen manufacturers is also given.—*Technologic Paper No. 86 of the Bureau of Standards.*

Scientific and Industrial Research

A Department Devoted to Reports of Investigations Contemplated or Completed. Research Facilities Available and Suggestions for Co-operative Work

Conducted by PROF. VLADIMIR KARAPETOFF, *Cornell University, Ithaca, N. Y.*

[PRINTED IN THE THIRD ISSUE OF EACH MONTH]

[When investigations which have been completed are, in the opinion of the editors, of wide enough interest to the field we serve, details thereof will be presented in other parts of this paper. Contemplated research or that which appears to have limited appeal will be only briefly reported in this section, but details may be had by communicating with the investigator or institution named in the report. Readers are referred to the department "Digest of Electrical Literature" for investigations reported in other journals. The news and engineering sections should also be followed for research reported before technical societies.]

Research Completed

Alloys, High-Resistance, Electrical Properties of

Three groups of alloys have been investigated: Materials of high resistance for use at temperatures below 500 deg. C., having nickel as their major component; materials of high resistance for use at temperatures above 500 deg. C., including alloys which are essentially combinations of nickel, iron and chromium in various proportions, and materials having special properties which render them useful under restricted conditions, such as the high-temperature coefficient of electrical resistance of pure nickel and the remarkably low-temperature coefficients of some alloys.—*M. A. Hunter and A. Jones, Rensselaer Polytechnic Institute, Troy, N. Y.*

Carbon and Graphite, Variations in Resistance of, with Air Pressure

Graphite in the presence of air at about one-quarter atmospheric pressure was found to have resistance about 4 per cent lower at 500 deg. C. than the same specimen had in a vacuum. This effect decreased with temperature, the resistance at room temperature being the same whether the specimen was in the air or vacuum. At about 2,200 deg. C. the length of carbon specimen was observed to increase, bending the specimen. This increase in length became permanent, and the bend remained even when the specimen was cooled.—*Bradford Noyes, Jr., Cornell University, Ithaca, N. Y.*

Corrosion Test, Accelerated Electrolytic

The accelerated electrolytic test consists in rotating a suitably prepared test piece of the metal or alloy to be tested for corrodibility as the anode in an electrolyte consisting of the corroding medium. The cathode is a platinum wire. A current of amperage sufficient to yield a current density of 0.18 amp. per square decimeter of anode area exposed is imposed. The anode is rotated at convenient speed and run until a weighable loss is obtained. Ordinarily the test will also give definite indication of the nature of the corrosion, e.g., the kind of coating formed and pitting, if any.—*R. J. Anderson, Pittsburgh, and G. M. Enos, Cincinnati.*

Oscillations, Source of Constant Frequency

Often the laboratory worker needs an electrical oscillator whose frequency may be varied over a rather wide range, but which will remain at the desired frequency when once adjusted. At present there seems to be no satisfactory device that will fulfill this need, for tube-driven forks are unsatisfactory at the best. In ordinary vacuum-tube oscillating circuits the frequency of the generated oscillations varies rapidly as the filament current and anode potential change. The writer has devised a system that will maintain the frequency virtually constant under rather trying conditions. Two tubes are used. For details see *Optical Society of America, Journal*, 1924, vol. 8, page 545.—*Ross Gunn, Yale University, New Haven, Conn.*

Refrigerator, Electric, Without Motor

Ammonia water is boiled by an electric heater, then the ammonia vapor is condensed by cooling water from city mains and again vaporized. Electric power is connected once a day for about one and one-half hours; it is then automatically disconnected. The device uses about 2.5 kw.-hr. of energy and 300 l. of cooling water per day.—*Allgemeine Elektricitäts Gesellschaft, Berlin, Germany.*

Relay for Direct-Current Network Protection

A relay has been developed which discriminates between short circuits and heavy overloads, even though the short-circuit setting may be smaller than the overload. For automatically restoring this short-circuited feeder to service after the arc which may have caused it has broken a resistance-measuring relay operates to reclose the breaker.—*Westinghouse Electric & Manufacturing Company, East Pittsburgh.*

Steam Turbine Rated 50,000 Kw.

After careful study the high-pressure and intermediate-pressure elements were separated so that they might expand freely. On account of the comparatively large volume in the reheater and its connected piping, the contained steam is no longer under control of the regular turbine governor, and special arrangements for governing are required to prevent the turbine from overspeeding in case of a sudden large reduction in load. As this machine is designed for 600 lb. initial steam pressure, special pipe flange standards are necessary.—*Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.*

Thermocouples, Base-Metal, Characteristics of Materials for

There is a need for some standard metal against which other metals and alloys can be checked to determine their suitability for thermocouples. Knowing the thermoelectric properties of any two metals compared with a standard material, the thermo-electric properties could be calculated for those two metals in combination. Such a standard would then correlate the work of various investigators and enable them more easily to select combinations that would make better thermocouples. Tests have been made in which the thermo-electric properties of a number of alloys were determined against copper used as a standard material. The method of calibration has proved satisfactory, and it is recommended that all new thermocouple materials be checked in the manner described. For details see paper presented before the 1924 annual meeting of the American Society for Testing Materials.—*F. E. Bash, Morristown, N. J.*

In Progress or Purposed

Coal, Study of

A few of the researches now being conducted in this section of the Bureau of Mines are: Microscopic work on constitution, geology and chemistry of coal; heat of distillation of coal; complete gasification of coal; fusibility of ash; spontaneous combustion of coal; gum-forming constituents in artificial gas; co-operative investigation of fuel-burning practices in ceramic kilns for burning refractories; co-operative investigation to determine the service conditions applying within boiler furnaces to determine proper application of refractories; heat transference in the various sections of a house-heating boiler; tests to determine the composition of gases arising from a fuel bed; comparative tests of anthracite and bituminous coals and coke in cast-iron sectional boilers; tests to determine the pressure required to force air through various sizes of anthracite; comparative value of anthracite and bituminous coals and coke in house-heating furnaces and boilers, and determination of proper relation between coal fired per square foot of grate surface to combustion volume for most efficient fuel-burning practice.—*H. W. Brooks, Bureau of Mines, Pittsburgh.*

Mine Disasters, Communication with Entombed Miners in

An investigation is being conducted on means of underground communication between entombed miners and rescue workers. The methods being investigated include the T. P. S. or ground-conduction method, induction signaling both at high and at low frequencies, line radio over underground mine power and telephone lines, trolley wires, rails and through piping for water and compressed air, radio, and electrical geophones and auxiliary equipment.—*Bureau of Mines, Pittsburgh.*

Hysteresis in Iron, Directional

If a soft-steel rod be placed within a magnetizing solenoid equipped with a secondary coil and the permeability be measured in the ballistic way, widely differing values are obtained when the rod is traversed by 60-cycle alternating currents of different strengths. Similar results are obtained when a tool-steel tube is substituted for the rod and the current is carried by a wire through and insulated from the tube. When the primary field is 0.57 gauss, a current of 60 amp. in the rod magnifies the apparent permeability about eight times. Increase of temperature increases the zero-current permeability while decreasing the anomalous values. At 350 deg. C. the permeability for 100 amp. is equal to that for zero current. These effects may be a manifestation of directional hysteresis in the magnetic induction caused by the variation in direction of the applied magnetic field.—*Edward Condon, University of California, Berkeley.*

Oils, Transformer, Life Tests of

Sludging of transformer oils has occupied much of the attention of the committee on electrical insulating materials of the American Society for Testing Materials. None of the various methods used heretofore have been considered by the committee to be entirely satisfactory as a general standard, and a new method is under trial. The experience with it so far has been so favorable that this method may be recommended as a tentative standard next year. For technical details see Appendix I to the 1924 report of committee D-9.—*E. A. Snyder, General Electric Company, Pittsfield, Mass.*

Suggestions for Research

Instruments, Clock-Driven

Synchronous-motor drives applied to clocks and curve-drawing apparatus, such as wattmeters, voltmeters, pressure and vacuum gages, etc., have not given universally satisfactory results. One of the principal sources of trouble seems to have been due to inadequate torque.—*Prime Movers Committee of the N. E. L. A.*

Instrument Transformers, Faults in, Indicator for

When energy is supplied in bulk from a high-tension circuit, a fault in a current or potential transformer may cause an error in the monthly meter reading amounting to a considerable sum of money. It is desired to develop a simple indicating device to call attention to such a fault, and also to the blowing of a fuse on a potential transformer, a broken connection, etc. For a foreign device of this kind see *A. E. G. Mitteilungen*, 1924, No. 3, page 67.

Machinery, Electrical, Temperature Rise

The 1924 report of the electrical machinery committee of the A. I. E. E. calls attention to certain desirable modifications in the present temperature standards as a result of actual experience under abnormal service conditions, for example at high altitudes. This question is of great practical importance, and its thorough study by both makers and users of machinery is earnestly recommended. A definite understanding must be arrived at as to what may be expected of a machine when it is used under conditions departing from those of the contract specifications or Institute rating.

News of the Industry

Chronicle of Important Events and General Activities, Announcements and Reports of Association Meetings, Court Decisions and Commission Rullings and News of Electrical Men

Fight Over Delinquent Tax

Puget Sound Company's Tax Payment Brings Argument Between Seattle and County Officials

PROBABILITY of a lawsuit on the part of the city of Seattle to collect from King County the city's share of interest on the $400,000 delinquent street railway tax recently collected from the Puget Sound Power & Light Company looms as the result of a formal demand by the city treasurer on the county treasurer and the latter's statement that he will refuse to pay. The state and school authorities are also expected to demand their share, and similar action may be brought by them. The county treasurer states that he will pay the city's share of the tax principal immediately. The delinquent street railway tax for 1919 was paid recently by the Puget Sound Power & Light Company after the sheriff had distrained personal property of the company, preparatory to its sale by auction. (See ELETRICAL WORLD, June 14, page 1248.)

The city's claimed share of the interest on the principal of $401,017.76 paid by the company is $113,725.27. The state's is about $34,000 and the school district's about $50,000. The total interest paid was $254,261.69. Of the principal paid by the company on June 7, three days prior to the date set by the sheriff for public sale of the company's personal property, the city's share is $179,365.78, the state's $52,-384.32, the county's $93,127.68 and the school district's $76,140.

The county treasurer will make formal tender to the city of its share of the principal, but on the ground that no provision exists in the statutes requiring the county to pay interest to the city, he will refuse to pay interest, basing his action on that portion of the statutes which says: "All collections from penalties and interest on delinquent taxes shall be credited to the (county) current expense fund."

Supplementing the treasurer's statement, the county will resist in the courts any attempt to collect the interest. City Corporation Counsel T. J. L. Kennedy denied the contention of the county treasurer, holding that the section in the statutes named refers only to real property, and that the street railway is personal property. The fact that the railway is personal property, he says, has been upheld by the State Supreme Court, which in several decisions has taken the ground that the interest follows the tax except where otherwise specifically provided by statute, as is done in the case of real property.

Should the case be fought out in court, as now seems certain, a decision for the city, state and school district might throw millions of dollars worth of personal property interest payments on delinquent taxes into the courts, for such interest has been paid into the county treasury without any specific statute covering such payments.

Later advices from Seattle state that on July 14 the Puget Sound Power & Light Company lost another skirmish in its battle with the city of Seattle to collect its share of the Municipal Street Railway taxes when Federal Judge Neterer in the United States Court rendered a decision sustaining the city's motion for dismissal of the company's amended and supplemental complaint in the suit pending since June 1. The basis of the decision was that the company could not be subrogated to any right in the special street railway fund. That the plaintiff must be relegated to its legal remedy against the city and that tax-collecting officers were within their authority in collecting the tax, was the decision of the court.

Business and Engineering Problems of Ohio Utilities

Cedar Point Convention Discusses Joint Problem of Private Business, New Business, Interconnection, Parallels and Crossings, Spontaneous Combustion and Radio Interference

MORE than six hundred persons attended the joint convention of the Ohio Electric Light Association and East Central Geographic Division of the National Electric Light Association at Cedar Point last week, the opening sessions of which were reported in the ELECTRICAL WORLD of July 12. Aside from the human factor in business, which was discussed from various angles in the first two days sessions, consideration was given chiefly to joint problems of all private business, developing new business, construction of parallels and crossings, interconnection, clinkering of ash, spontaneous combustion of coal and radio interference.

The keynote of an address by Henry Swift Ives, Chicago, was that all persons engaged in private business have a problem in common, namely, the joint opposition of socialization of industry. While 85 to 90 per cent of the public detests government ownership, still they allow a minority of only 10 to 15 per cent who believe otherwise to rule. Government ownership, he declared, is just another step to socialization and an attempt to socialize any one business is indirectly a blow at all private business. Each group is fighting its own battles instead of recognizing the common problem, he contended.

Various persons expressed themselves regarding the best way to develop central-station business during the next few years. In nearly all cases, some kind of lighting campaign was suggested, although Wirt Scott, Pittsburgh, made a strong appeal for a more comprehensive effort in building electric heating loads.

The theory, benefit, scope and limitations of interconnection were discussed by M. L. Sindeband, New York City, who likened the development in electric transmission to the growth of railroad systems. Interconnections must be justified by load studies and the cost thereof balanced against the cost of new stations, which will make equal capacity available. Until high voltage cable can be developed for bringing energy into cities, generating stations will have to be continued in large cities, even where there is extensive interconnection. Unless there are radical changes in design, however, stations will probably be limited to three or four hundred thousand kilowatts. Since interconnection is chiefly to permit the shift or transfer of power between points close together, there should be no need of voltages as high as 220,000 except in rare cases, Mr. Sindeband declared.

Stephen Q. Hayes, Pittsburgh, urged differentiating between interconnection and superpower. Two outstanding advantages of interconnection are: (1) that it permits one station to act as a reserve for the other and (2) makes a market more immediately available for new plants. In the interchange of power, operators must watch out for exchange of wattless current, the speaker warned.

Handling of radio interference problems and factors which should be considered in the codification of any rules governing crossings and parallel construction were considered by Prof. A. M. Wilson, Cincinnati, Ohio, and several persons following him. Regarding radio interference, education is the remedy and not legislation, he declared. Because of the increased energy consumption in homes where radio equipment is used, central stations should be more interested in investigating the complaints of radio users.

Commenting on the construction of

electric power lines adjacent to other utility services, Professor Wilson declared that rules in order to be equitable should be formulated as though all of the utilities were consolidated. Before new requirements are made, the old ones should be proved unsatisfactory.

Service requirements have changed but codes have not kept pace with them, declared Frank Howard, Canton, Ohio, who referred to a situation in which the voltage should be raised from 6,600 to 13,200 to improve service, but this could not be done without overbuilding owing to joint pole agreements with the telephone companies. The speaker did not favor such construction where co-operative building is possible.

Rules mean nothing unless there is co-operation, said M. L. Sindeband, who urged the education of telephone companies to the need of higher voltages for power transmission, and telephone protective equipment to permit it. M. H. Wagner, Dayton, Ohio, called attention to the difficulty of justifying rural-line expense in any event without severe construction requirements and called particular attention to the difficulty of securing agreements with independent telephone companies for joint usage of poles. Voltage should be no limitation to joint use, he declared, and emphasized the need of modifying codes regularly.

D. H. Keyes, American Telephone & Telegraph Company, expressed the opinion that central stations should have no trouble in handling today's specific problems if they are properly approached. The joint general committee on inductive co-ordination is making very satisfactory progress in handling the abstract problems. While carrier-current telephone systems can be protected from 132,000-volt lines, the protective equipment is too expensive for ordinary telephone use, the speaker declared, and a cheaper method will have to be developed. In closing, Mr. Keyes said that codes cannot be developed which will please every one, since they must of necessity be compromises. However, they should be kept up to date.

Service Conditions Unsettled in Colorado Springs

Since the voters of Colorado Springs refused to renew the franchise of the Colorado Springs Light, Heat & Power Company and also voted a bond issue to provide for a municipally owned plant, the builders of new homes are figuratively "up a tree." As the city is not yet ready to supply electric service, applications are being taken and executed by the private company provided the applicant pays the total cost for the work. In one instance a single service involving a short extension amounted to $74, which the customer appealed for redress to the city commissioners, claiming the charge excessive. The company, however, has taken a firm stand in its determination to charge for all services on the grounds that it is the only safe business policy and that it is acting within the regulations prescribed by the utilities commission.

While on May 20 the property holders of Colorado Springs voted a bond issue of $1,250,000 for the purpose of buying or building a plant for municipal operation, the stumbling block lies in the fact that the city has offered to purchase only the company's transmission and distribution system but refuses to consider the company's main steam plant. On the other hand the private company offers to sell only its entire electric property.

Ohio Association Sings Swan Song

Thirty-Year Old Electric Organization Joins East Central Division, N.E.L.A., on Jan. 1

AFTER thirty years of active work which has won for it the reputation of one of the most progressive state associations in the United States, the Ohio Electric Light Association passed a resolution at its annual convention at Cedar Point July 10 to become a part of the East Central Geographic Division of the National Electric Light Association. In so doing, the association requested that the publication of its monthly bulletin be taken over by the N.E.L.A.

The resolution which effected this consolidation also provided that the Ohio association may resume its activities at any time if the geographic division of the N.E.L.A. does not meet the needs of Ohio companies. However, it is not expected by the association to exercise this privilege, as it is confidently believed by the executive committee that activities can be carried on even better under the new arrangements than they have in the past.

The actual dissolution of the Ohio association will not occur until Jan. 1, 1925, because its business cannot be wound up before that time.

D. L. Gaskill, who has been secretary-treasurer of the association virtually since its inception, presented the recommendation of the executive committee on which action was taken. He pointed out that while the association has achieved results in which it takes great pride, conditions have arisen that make it unwise to continue a state association longer. Whereas there were formerly 130 distinct companies in Ohio there are only 45 now, due to the consolidation of some under holding companies. Since the financial support of the state association had to come from assessment of each of these companies and since some of these companies are also being assessed for membership in the N.E.L.A., there has arisen a duplication of financial burden, convention and committee activity, traveling and other expense which is unjustified.

The discontinuance of the Ohio association should not be looked upon, said A. Jackson Marshall, secretary of the N.E.L.A., addressing the convention, as the result of an attempt by the national association to gobble up competing state associations. On the other hand it is hoped through the divisional organization of the N.E.L.A. to afford geographical sections of the country all the advantages of state organizations and also provide them a national tie through the parent body without duplication of expenses, time or effort. Mr. Marshall went on to explain how this can be accomplished by the program for decentralization and development of geographic divisions, in which committee work will be actively conducted along lines of local as well as national interest and co-ordinated by the national body. The national conventions can be devoted to high points of national interest.

During the remainder of this year the activities of the Ohio association will be under the direction and supervision of the following newly elected officers: T. O. Kennedy, president; C. I. Weaver, first vice-president; C. L. Allis, second vice-president; D. L. Gaskill, secretary-treasurer; and an executive committee composed of Frank Espey, Robert Lindsay, R. S. Graves, S. D. Heed and L. G. Tighe. Representatives of Ohio on the east central geographic division committee of the N.E.L.A. will be W. W. Freeman, D. L. Gaskill and O. H. Hutchings.

Plans for Camp Co-operation IV Well Advanced

Acting on a resolution passed at Camp Co-operation III, held in September last year, the Society for Electrical Development has organized Camp Co-operation IV, the third annual conference of representatives of national and local co-operative organizations and others interested in local business-building activities. The dates of the conference are September 2 to 6, and the place is, as before, Association Island, Henderson Harbor (Lake Ontario), N. Y.

The capacity of Association Island being limited, it has been necessary to confine invitations to those definitely interested in local co-operative work. A committee under the chairmanship of J. E. North, president of the Electrical League of Cleveland, is responsible for the business program, and some of the subjects selected by this committee are "The Red Seal Campaign," "Selling Electrical Merchandise Through Community Electrical Exhibits," "How to Interest Women in Electrical Equipment for the Home," "Field Service Work", "Store-Lighting Campaigns," "Selling More and Better Industrial Electrical Equipment" and "How the Local Electrical Co-operative Organization Benefits the Various Branches of the Industry."

At least one full business session will be devoted to the home-lighting contest sponsored by the Lighting Educational Committee of the industry. The necessity for some satisfactory method of tying in local co-operative organizations was discussed last year, and a committee under the chairmanship of Earl E. Whitehorne was appointed to draw up a plan. This committee will report. An entertainment committee, with J. S. Tritle as chairman will arrange for golf, tennis, yachting, bowling, swimming, fishing, etc. Ladies are again invited, and it is expected that the number will be considerably increased.

A meeting of the advisory publicity council of the Society for Electrical

Development, under the chairmanship of L. D. Gibbs of Boston, will take place September 1, the day preceding the opening of the camp. Progress reports giving information about transportation, business program and entertainment features will be sent out periodically by the society, which those interested should address at 522 Fifth Avenue, New York.

Hydro-Electric Development in Georgia

The $2,500,000 recently raised by the Georgia Railway & Power Company through the successful sale of 7 per cent first preferred stock, will be used in pushing the company's 1924 hydro-electric development program. In announcing the satisfactory sale of this stock, the company states that the work on the 1924 program is rapidly being pushed to completion. It is the company's plan to spend approximately $8,000,000 for new water-power plants and transmission lines during this year. This program calls for the completion of the Terrora development located between Tallulah Falls and Lakemont.

The mile-long tunnel which will carry the water of the Tallulah River from Lakemont to the power house at Terrora was finished on July 4, and it is believed that the plant will be in full operation by the first of the year. Work is also progressing rapidly on the Yonah development. Pouring of concrete in the big dam started several weeks ago, and the project will be completed some time in 1925.

A statement issued by the power company declared that the raising of funds for hydro-electric development in Georgia was indicative of the faith investors have in the future of the state. "It is gratifying to know," said the statement, "that investors have sufficient faith in Georgia to put their money into the stock of this company and so make possible the carrying out of the large program of water-power developments."

Smithsonian Institution Analyzes Rural Service

A bulletin recently issued by the Smithsonian Institution bearing the title "Analysis of Electric Service for Rural Homes" and prepared by Samuel S. Wyer is a valuable addition to its 1919 publication "Energy Resources of the United States—A Field for Reconstruction" and to the summary of the government's survey of power resources in the Northern Atlantic Coast States made in the institution's "Study of Natural Resources Applied to Pennsylvania's Resources." The bulletin on rural electric service takes up in turn the desirability of electric power for rural homes and the economic limitations of high-tension lines for such service and concludes with the following comprehensive summary of the conditions:

"The putting of labor-saving standards of the rural home on at least the same plane as the barn and the field is of national importance in the bearing that it will have in making for rural home contentment and welfare of the coming generation.

"The desirability of electric service for rural homes cannot be debatable. The only open questions are how the rural consumer can meet the installation costs of the electric equipment and the operating costs of the service and whether it is better to extend high-tension lines or generate electric current on the farm in a small isolated plant. In many rural homes the latter is the only feasible way certainly for many years.

"The electric heating of rural homes is not within the realm of the practical.

"Electricity for cooking will cost more than other fuels. Furthermore, reduced rates for cooking as compared with other domestic service—except for quantity used—cannot be justified in social justice and non-discrimination to all customers, both rural and urban, served by the utilities.

"While there will be extensions to rural homes that are immediately adjacent to electric transmission lines, such extensions cannot become general because of economic limitations, and a large percentage of the rural homes for the future, or certainly for many years, cannot enjoy the benefits of electric service from high-tension transmission lines fed from remote power stations."

Pioneers to the Coast

Special Train to A.I.E.E. Convention in Pasadena—Elaborate Entertainments Promised

ELECTRICAL pioneers, prominent utility executives and the foremost electrical engineers in the industry are planning to accept an invitation from the Pacific Coast members of the American Institute of Electrical Engineers to attend the Pasadena convention, October 13-17.

A special train from New York and Chicago is planned with stop-over visits in Colorado Springs, Royal Gorge, Salt Lake City, Feather River Canyon, San Francisco and Yosemite Park. Upon arrival at Pasadena the visitors will attend the convention of the A.I.E.E. held in connection with the fiftieth anniversary celebration of Pasadena. A splendid program has been prepared covering engineering and entertainment features, talks by prominent utility executives and an address by a government official of high rank.

An unusual feature of the meeting will be the presentation of the results of several researches from the Norman Bridge Laboratory and an address by Dr. Millikan. Some notable papers on high-voltage transmission and corona will be presented by specialists, and papers on the utilization and application of electricity in industry are under preparation.

The special train will leave New York about September 25 and among those planning to go are Elihu Thomson, Carl Hering, Frederick Bedell, W. J. Foster, Harold Pender, F. W. Peek, Jr., E. E. F. Creighton, Farley Osgood and other prominent engineers with their families. Professor R. W. Sorenson is chairman of the convention committee and announces splendid plans for entertaining the visitors during the convention.

Better Home Lighting Activity Gains Greater Momentum

Sixty-eight cities in twenty-three states have signified their intention of holding local home lighting contests in connection with the Better Home Lighting Activity being carried on by the lighting educational committee, of which J. E. Davidson is chairman. The accompanying list of cities shows only a small proportion of the number that will have campaigns, as the regional directors in the various sections have been extremely active in the past two weeks in visiting the different communities.

The most important event of the week was the meeting held in Chicago, which was attended by about 200 central station executives, jobbers, contractor-dealers and other important electrical men in the states of Illinois, Michigan, Wisconsin and Indiana. The rising roll call showed very complete representation from the four states. The central-station executives present represented companies which serve more than 80 per cent of the population of the territory. The meeting was addressed by John F. Gilchrist, W. L. Goodwin and J. E. Davidson. The presidents of the four state associations were appointed state directors of the Home Lighting Contest by Mr. Gilchrist, chairman of the general committee, and work was immediately started to organize their districts.

The members of the general committee for the sixth regional district are: B. H. Peck, William McGuineas, N. G. Harvey, W. O. Batchelder, Paul W. Koch, Frank J. Haas, R. P. Oblinger, H. D. James, W. H. Morton, Roy T. Duncan, W. G. Clark, E. McCleary, G. C. Neff, J. C. Schmidtbauer, C. E. Searle, L. W. Burch and John F. Gilchrist, chairman.

CITIES DEFINITELY COMMITTED TO HOME LIGHTING CONTESTS

Alabama
Birmingham

California
Fresno
Los Angeles
San Francisco

Canada
Windsor, Ont.

Colorado
Denver

District of Columbia
Washington

Florida
Jacksonville
Miami
St. Petersburg
Tampa

Georgia
Athens
Atlanta
Augusta
Columbus
Macon
Savannah

Illinois
Chicago

Iowa
Des Moines

Kansas
Wichita

Louisiana
New Orleans

Massachusetts
Boston
Malden

Michigan
Detroit
Grand Rapids
Jackson

Minnesota
Minneapolis
St. Paul

Missouri
Kansas City
St. Louis

Nebraska
Lincoln
Omaha

New Jersey
Atlantic City

New York State
Beacon
Buffalo
Geneva
Kingston
Newburgh
New York City
Poughkeepsie
Rochester

Ohio
Akron
Alliance
Ashland
Canton
Cincinnati
Cleveland
Columbus
Dayton
Elyria
Lorain
Mansfield
Massillon
Springfield
Warren
Youngstown
Zanesville

Oregon
Portland

Pennsylvania
Altoona
Philadelphia
Pittsburgh

Rhode Island
Providence

Tennessee
Chattanooga
Knoxville

Texas
Dallas
Ft. Worth

Wisconsin
Beloit
Milwaukee

New Specifications Submitted to Standards Committee

The American Society for Testing Materials has submitted to the American Engineering Standards Committee for approval as American standards specifications for hard-drawn copper wire, medium-hard-drawn copper wire and tinned, soft or annealed copper wire. The specifications include requirements for purity of material, diameter, gaging, finish, tensile strength and elongation, specific gravity, electric conductivity, chemical test methods, packing and inspection. The proposed standards have been submitted to a committee of which H. S. Osborne is chairman.

The National Machine Tool Builders' Association has formally proposed to the American Engineering Standards Committee that there should be standardization of important dimensions of electric motors for use on machine tools. In presenting the recommendation E. F. Dubrul, general manager, said:

"Great loss is caused to users of machine tools by the present lack of dimensional standardization, particularly in the distance between the motor feet, both longitudinally and laterally, and also the height of the motor shaft from the bottom of the feet. We feel that this distance could and should be standardized for motors of a given rating, so that the same base plates could be provided regardless of the make of motor. The number of revolutions being standardized, this dimensional standardization should, to our minds, present no more grave difficulties."

October Convention of the Illuminating Engineers

The annual convention of the Illuminating Engineering Society will be held during the week of October 27 to 31 at Briarcliff Lodge, Briarcliff Manor, N. Y. By fixing so late a date any possible conflict with other conventions has been eliminated, while the place of meeting, an hour's ride from New York City, will afford delightful fall surroundings.

A well-rounded papers program is being arranged by Frank C. Taylor, chairman of the committee on papers, embracing such subjects as daylight illumination in factories, sky brightness report, color standards and nomenclature, store, window and showcase lighting, theatrical and decorative lighting, street-lighting practice in the United States, school lighting, light and the speed of vision, psychology of light and color, glare and eye defects in industrial work. There will also be a session at the Boyce Thompson Institute for Plant Research devoted to the effect of light on plant growth.

William J. Clark, vice-president of the Westchester Lighting Company, is general chairman of the convention committee and is directing the preparation of an entertainment program containing a diversity of features which will make it of unusual interest.

Warning Note Uttered on Water Power

North Carolina Geological and Economic Survey Points to Wasteful Methods and Complains that Law Is Ambiguous—Many Complications

IN A warning statement issued by the North Carolina Geological and Economic Survey it is declared that the prevention of an economic tragedy in the field of water-power development such as has taken place in the forestry industry of the country can only be achieved through the formulation of a well-considered policy of efficient utilization of the total capacity of all power sites. Hydro-electric energy, the survey thinks, is assuming an increasing importance in view of the fact that cheap foreign labor is being kept out of the country and that the drift from the farm to the city is making agriculture more and more dependent upon electric power to replace the manual labor thus lost to it.

In many cases it was found by the survey that there are heavy losses in power due to faulty development, while in others neglect and mistreatment of their possibilities result in the squandering of irreplaceable natural resources. With distinct limits on the amount of water power, the conservation of the future, declares the survey, must be fixed attentively on the problem of capturing and making available to the utmost every potential horsepower in sight.

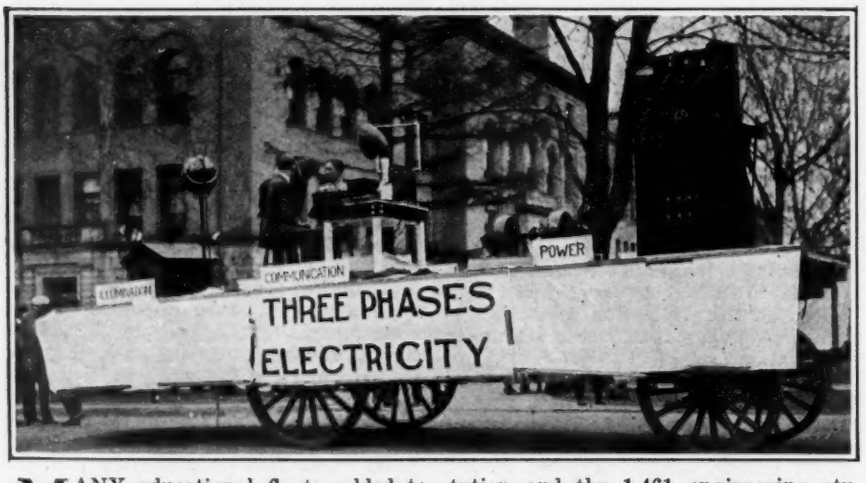
As an example of the waste now going on there is cited the case of a development in North Carolina which produces 150 primary twenty-four-hour horsepower and 700 secondary ten-hour horsepower. At the minimum rate of return the 150 horsepower produces income of $65 per horsepower per year, or $9,750. The 700 secondary horsepower at $30 produces $8,750. The total minimum income is $18,500.

"This development, however," says the statement, "takes off a twenty-foot fall lower down on the same stream which would be capable of producing 884 primary power, with a minimum return of $57,000 per year, and 300 secondary power, producing $9,000, or a total minimum of $66,000. In other words, unconsidered development of this one secondary stream is costing a loss, as against a reasonable revenue from adequate development of $47,000 a year.

"It must be realized, of course, that no account is taken in these figures of the speculative loss incident to power that would otherwise be available to industry, and that to the loss must be added the greater relative charges of maintenance of a plant that fails to utilize its maximum opportunity. Horsepower here is going to waste. With it goes waste of dollars. With waste of dollars goes wasted energy in industry. With that, smaller production, fewer employees, less wages. Before we are done with the sliding scale of waste the state is missing out by a million or more active income dollars and other millions figured in investments and taxable resources.

"Another and more startling instance is a development on a stream whose strategic position and course link it with the dream of conserved water powers in the large sense upon which growing industry must within a very few years depend. This development carries an installed water power of about 1,500, of which 250 is primary. But because of its location on the river it might very well involve a loss of 200 cubic feet per second per square mile taken off a dam below and available for a fall of over 900 ft. to Muscle Shoals—or 20,000 hp. at a mini-

Electrical Engineering Students Enter Float in Parade



MANY educational floats added to the interest of the parade which was a part of the celebration at Urbana, Ill., of the annual Engineering Day at the University of Illinois late this spring. The entire faculty of the College of Engineering of that institution and the 1,461 engineering students, as well as the administrative officers of the university, took part in the day's celebration. The float shown above was entered by the students in the department of electrical engineering.

mum rate of return of $65 per year. The possible income of the smaller development is $20,000 per year. The potential loss, estimating only the return from sale of power at a minimum rate, is $1,300,000 per year by reason of it.

"A problem of a different kind involving a power horse of a different color is the situation on another stream where one company owns two available sites, the more valuable of which it permits to remain idle. It has developed the upper one at a cost of $480,000, with 240 hp. installed. It gets primary horsepower of 60. Its annual income is probably about $18,000. By reason of the upper development the lower site can now be developed for only 30 ft. instead of the 55 ft. the upper development would have permitted. The difference is equivalent to at least 150 hp. or more than twice the present primary power in the upper development. The increase in annual income from a real development of this logical stream site would be in the neighborhood of $6,000.

"Lack of a comprehensive law as to what may be done in and with water powers is emphasized more strikingly by power still going to waste in the presence of the ambiguity of the law than in the cases of inadequate or repressive developments of which instances have been cited.

"One of the greatest water-power developments contemplated in western North Carolina is now in its tenth year of litigation, and for ten times 365 days millions of dollars have thereby run out of the state and have been lost in the Gulf of Mexico. It is not to be understood that this litigation is ill-founded or wanton, or that it does not present many serious problems. In the particular case the proposed development would flood hundreds on hundreds of acres of valuable agricultural land. On the other hand, it would open up to development a rich but latent mineral resource. It would change topography and inundate many highways. In this case the Federal Power Commission hesitates. It 'would and it wouldn't.' After all, the chief concern is North Carolina's—its power, its industry, its lands, highways, etc. Why should it not assume to settle in its own interest the interest that primarily belongs to it?

"There are other cases in which long-acquired water rights operate to prevent logical developments not dreamed of and unconsidered when court opinions vested them as virtual perpetual monopolies of what are now known as public assets. There are cases in which power companies have stopped developments of streams by bringing in power and selling it at a loss, with the result that, after equipment and connections have been made, a higher rate will make the development immediately unprofitable as an alternative—the net result being that so much power is lost to the state."

Japan Adopts the Metric System

On July 1 of this year the metric system of measurement became official in Japan, according to a recent imperial ordinance which puts into effect a law passed in 1921 providing for the use of the metric system, with a view of gradually displacing the complicated Japanese weights and measures.

This law does not contemplate the immediate universal use of metric units, since it is realized that it will require considerable time to overcome the numerous difficulties. The great majority of the Japanese people understand only the native units. There are also very formidable physical and financial difficulties to overcome.

Power Curtailed 25 per Cent in Southern California

To meet the shortage of power in California caused by the unprecedented drouth of the past winter the Southern California Edison Company, at the direction of the State Railroad Commission, has issued a letter to its 250,000 consumers requesting them to restrict their use of electric energy by at least 25 per cent. The power shortage in kilowatt-hours, the company states, is equivalent to 25 per cent of the estimated requirements and individual customers of all classes are expected to make effective reductions in their use of energy. The following specific instructions for curtailment of service of various classifications are a part of the order:

Domestic Consumers.—Consumption of energy for residence lighting and for the operation of electric appliances for all uses should be reduced to a minimum and discontinued entirely where gas or other heating is available. Two lamps should not burn where one would be sufficient and appliances must not be left in circuit when not actually in operation.

Commercial Consumers.—All decorative, display, sign and window lighting to be entirely eliminated. Interior illumination for stores, warehouses and other places of business should be discontinued in the daylight hours and reduced during other hours not less than 25 per cent.

Industrial Plants.—All manufacturing and industrial plants must cut the use of electric energy by a full 25 per cent. This includes energy for both lighting and power uses. Such cut to be made between the hours of 6 a.m. and 10 p.m.

Agricultural Consumers.—Power used for irrigation must be reduced as much as possible, having due regard for the necessary requirements of growing crops. Those in charge of pumping plants should see that no pumped water is wasted through careless operation. Where the farmer can use a gasoline engine or a tractor to drive his pump it is necessary that he should co-operate to that extent.

Street Lighting.—It will be necessary to reduce the number of lamps in use on all streets and highways to a minimum. One or two lights in a block will be required to take the place of five or six which may now be in use. In other instances where the same number of lamps must be kept burning as heretofore the candlepower of each lamp shall be reduced 50 per cent.

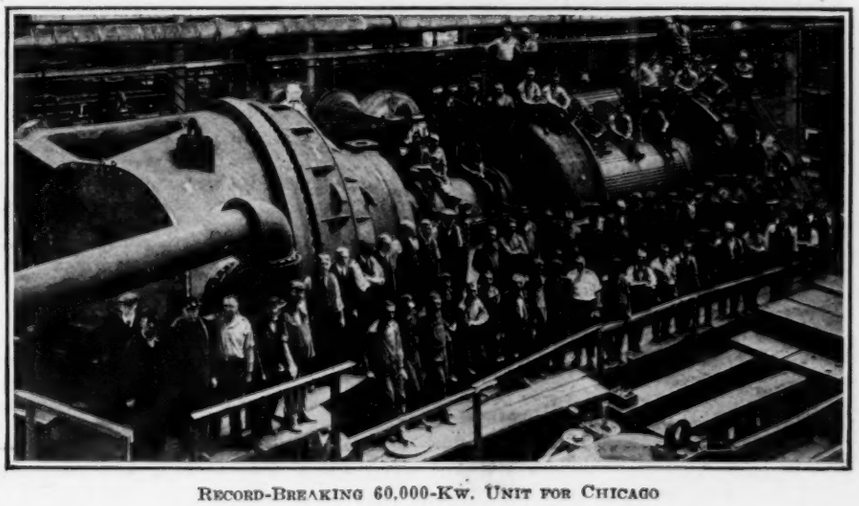
Street Railways.—Companies operating electric cars for city and suburban service will be required to reduce their demand 25 per cent, even if it is necessary to reduce the number of cars in operation to the same extent.

Turbo-Generator for New Chicago Station

Below is a view of the low pressure end of a 60,000-kw. turbine built by the General Electric Company for installation in the new Crawford Avenue station of the Commonwealth Edison Company. The turbine consists of two cross-compound units, the steam being superheated after it leaves the high-pressure cylinder. The following data apply to the units:

	High Pressure	Low Pressure
Rating, kilowatts	17,000	43,000
Revolutions per minute	1,800	1,200
Initial pressure, absolute	550	110
Initial steam temperature, Fahrenheit	725	725
Exhaust pressure, pounds absolute	110	0.5
Stages	10	14

The high-pressure unit drives two generators, one main unit rated 17,000 kw. and the other rated 2,000 kw., for supplying house service. The low-pressure unit drives a 43,000-kw. generator with its direct-connected exciter. The low-pressure unit exhausts through two passages and the over-all length of the low-pressure unit is 62 ft. The over-all length of the high-pressure unit is 58 ft.



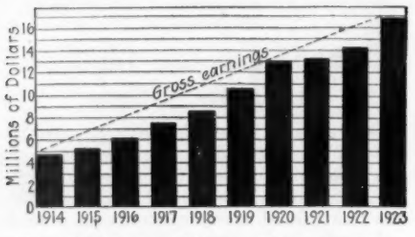
RECORD-BREAKING 60,000-KW. UNIT FOR CHICAGO

Financial and Corporate

Consumers Power Wins Public Good Will

Most large enterprises are distinguished from all other enterprises operating in the same field by some special or outstanding line of endeavor. This is as true in the central-station industry as in other industries. The Consumers Power Company of Michigan is a typical example of central-station specialized activity.

It has always been the policy of the Consumers Power Company to enlarge the field for its products, but during 1923 an unusually extensive campaign was made to familiarize the public with



THE CONSUMERS POWER COMPANY HAS NEVER REPORTED A DECREASE IN ANNUAL REVENUE

the many advantages and uses of electricity. A total of 123,086 inspections were made in homes, stores and factories during the year, and the results as regards both the company and its customers were most satisfactory, alike in increased sales and customers' good will.

The second special activity of the company was in increased sales of stock to customers. A total of 50,482 shares of $5,048,200 par value of 6.6 per cent preferred stock were sold during 1923 to 11,299 individuals, of whom 5,894 were new investors and the remainder were old stockholders who increased their holdings.

The volume of business done by the company in 1923 was the largest in its history. Sales of electricity showed an increase of 28.03 per cent over 1922. This rapid growth called for a development program during the year involving an expenditure of $10,962,979.

Preferred Stock Prominent Element in Recent Utility Financing

During the week ended July 15 several sizable offerings of preferred stock appeared among the new electric light and power issues. The Los Angeles Gas & Electric Corporation issued 6 per cent cumulative preferred stock to the amount of $5,000,000 at 90 and accrued dividend to yield 6.67 per cent. Another $5,000,000 issue of cumulative preferred stock was brought out by the Illinois Power & Light Corporation, the price being $95 per share, plus accrued dividend, and the yield 7.37 per cent. Of this offering $2,600,000 has been placed privately, the balance being offered for subscription. With the purpose of raising funds to be applied to the cost of additions, extensions and improvements and to other corporate purposes the Carolina Power & Light Company offered 8,000 shares of 7 per cent cumulative preferred stock, no par value, at 99½ and accrued dividend, to yield 7.04 per cent. One of the smaller issues was the $1,000,000 offering of 7 per cent cumulative prior preferred stock, series A, of the Portland (Ore.) Electric Power Company at 98½ and dividends, to yield 7.10 per cent.

The largest issue of bonds during this period was the $6,000,000 offering of first and refunding mortgage gold bonds, 6 per cent series, due 1954, of the Luzerne County Gas & Electric Corporation at 98 less discount, yielding about 6.15 per cent. The discount will be allowed at the coupon rate from date of payment to September 1. The Kewanee Public Service Company offered first mortgage 6 per cent gold bonds, series A, amounting to $1,200,000 at 95 and accrued interest, yielding over 6.40 per cent.

Among the smaller bond issues were the following: A $1,000,000 issue of Houston (Tex.) Lighting & Power Company first lien and refunding mortgage gold bonds, series A, 5 per cent, at 91½ and interest, and the yield 5.60; Pennsylvania Water & Power Company first refunding mortgage 5½ per cent gold bonds, series A, amounting to $1,000,000, offered at 99 and interest, to yield over 5.55 per cent; Virginia Northern Power Company first mortgage 6½ per cent gold bonds, series A, amounting to $375,000, at 96 and interest, yielding about 6.87 per cent.

Record of Electric Light and Power Preferred Stocks

In No Case Are There Accumulated Back Dividends Unpaid—Establishes Position of Public Utility Stocks as Safe Investments

VARIOUS investment houses have made careful studies of central-station financing, and the results serve to bring out more clearly the stability of electric light and power securities and to establish definitely their position as safe investments. Bonbright & Company of New York have made a very interesting study of the preferred-stock dividend record of this type of securities.

This study included practically every electric light and power operating company with gross earnings of two million dollars per year and more. The combined capitalization of these companies represented approximately 90 per cent of the total capitalization of all of the electric light and power companies in the United States. The list included 116 companies, of which ninety-eight have preferred stock and eighteen have only common stock outstanding. It was found that of the ninety-eight companies having preferred stock eighty-three companies have never postponed a preferred dividend since such stocks were issued. The majority of these have been outstanding for ten years or more.

Fifteen of the companies having preferred stock had accumulations, now paid off in stock, cash or both. Many of the companies included in this analysis conduct traction operations in addition to their electric light and power business. The contributing causes of these deferred dividends seem to have been about equally divided between the high cost in recent years of such traction operation and the heavy expense incurred in initiating hydro-electric enterprises. Of the eighteen companies having only common stock outstanding, one company does not make public its records, thirteen companies have an unbroken dividend record for fifteen years or more, and four companies have an unbroken dividend record for five to fifteen years. It was found that every one of these 116 companies was paying current cash dividends.

High Spots in Preferred Stock Record

1. Current cash dividends are being paid on all of the preferred stocks included in this analysis.
2. In no case are there accumulated back dividends unpaid.
3. In fifteen cases dividends have been deferred but have subsequently been paid off in stock or cash.
4. In the other eighty-three cases the preferred stocks have unbroken dividend records.

Merger of Canadian Companies

A merger of the Western Quebec Power Company and the Hawkesbury Electric Light & Power Company has been completed under the name of the Ottawa-Montreal Power Company. The capitalization of the new company is to be $5,000,000 of bonds, of which only $1,250,000 have been issued and oversubscribed; $1,000,000 of preferred stock, of which only $225,000 have been issued to pay for certain properties, and 25,000 shares of common stock, no par value, only 15,000 shares being issued.

Stock and Bond Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par value of stocks is $100.)

Companies	Bid Price Saturday, July 12	Low 1924	High 1924
PREFERRED STOCKS			
Operating Companies			
Adirondack Power & Light 7 per cent	95½	94	97¾
Appalachian Power, 7 per cent	89½	85½	90
Arkansas Light & Power 7 per cent	89	81	93
Asheville Power & Light 7 per cent	96	96	99
Carolina Power & Light 7 per cent	96	95½	100
Central Illinois Public Service 6 per cent	84	84	87
Central Indiana Power 7 per cent	84	80	88
Colorado Power 7 per cent	87	90	97
Connecticut Light & Power 7 per cent	99	99	102
Consumers' Power 6 per cent	86	85	90
Dayton Power & Light 6 per cent	83	84	90
Duquesne Light 7 per cent	105	103½	107½
Eastern Texas Electric 6 per cent	89	81	95
Empire District Electric 6 per cent	73	70	78
Fort Worth Power & Light 7 per cent	97	97	100
Great Western Power 7 per cent	97	96	98
Illinois Northern Utilities 6 per cent	82	82	87
Kansas Gas & Electric 7 per cent	93	92	97
Long Island Light 7 per cent	98	95	98
Minnesota Power & Light 6 per cent	84	78	87
Mississippi River Power 6 per cent	84	80	87
Nebraska Power 7 per cent	96	89	99
Niagara Falls Power 7 per cent—25	a 27¾	27	27¾
Niagara, Lockport & Ont. Power 7 per cent	102	99½	104½
Northern States Power 7 per cent	92¾	91	97
Ohio Public Service 7 per cent	89	86	93
Pacific Gas & Electric 6 per cent	90	85½	92½
Penn-Ohio Power & Light 7 per cent	96½	84	96½
Pennsylvania Power & Light 7 per cent—no par	96½	93	99
Penn. Public Service 7 per cent	90	90	100
Southern California Edison 8 per cent	115	112	119
Tennessee Electric Power, no par	76½	71	79½
Texas Power & Light 7 per cent	96½	95	96½
‡Philadelphia Electric 8 per cent—25	35	29	36¾
Utah Power & Light 7 per cent	96	94	96½
Western States Gas & Electric 7 per cent	78	78	85
Yadkin River Power, 7 per cent	96	94	96½
Holding Companies			
American Gas & Electric 6 per cent—50	45¾	41¾	46
American Light & Traction	91	91	94½
American Power & Light 6 per cent	90	84	90
American Public Service 7 per cent	84	84	88
American Public Utilities 7 per cent	77	73	85
American Water Works & Electric 7 per cent	a 99	89½	99
Carolina Power & Light	97½	95½	99
Cities Service 6 per cent	72½	67	73¾
Consolidated Gas 6 per cent—50	56	51	58
Continental Gas & Electric 7 per cent	85½	69	90
Electric Bond & Share 6 per cent	101	96½	103
General Gas & Electric 8 per cent—no par	100	96	100
Illinois Power & Light 7 per cent	92	84	95
Middle West Utilities 6 per cent	86	80	89
National Power & Light 7 per cent—no par	89	84	96½
North American 6 per cent—50	a 50½	43¾	50½
Philadelphia Company 6 per cent—50	a 52½	42½	53½
Public Service Corp. of N. J. 7 per cent	97½	96¼	100
Public Service Corp. of N. J. 8 per cent	104	99¼	108
Standard Gas & Electric 8 per cent—50	49½	46½	49½
‡United Gas Improvement—50	57	55¼	58
United Light & Power 6½ per cent—no par	76	75¼	80
COMMON STOCKS			
Operating Companies			
Adirondack Power & Light—50	32½	22½	34
Appalachian Power—no par	77	66½	93
Arkansas Light & Power	42½	22	44½
Brooklyn Edison	a 114	107½	116
Buffalo General Electric	146	118	150
Carolina Power & Light	140	82½	150
Colorado Power	33	21	35
Commonwealth Edison	126	126	135
§Consolidated Gas, Electric Light & Power	a 117½	113	118½
Dayton Power & Light	108	70	115
Detroit Edison	a 106¾	102½	108½
|| Edison Electric Illuminating of Boston	a 180	163¾	181
‡Erie Lighting	29½	23¾	30
*Kentucky Hydro-Electric	87½	85¼	87½
Long Island Lighting	175	100	180
Mississippi River Power	28	18¼	30
Montana Power	a 69½	61¼	71
Niagara Falls Power—no par	45	45	48
Niagara, Lockport & Ontario Power—no par	54	45	59
Northern Ohio Electric—no par	10	5	16
Northern States Power	99	92	106
North Texas Electric	59	58	84
Pacific Gas & Electric	a 95¾	90½	95¾
‡Penn Central Light & Power—no par	a 59½	57	60
Pennsylvania Water & Power	107	98¾	110
‡Philadelphia Electric—25	a 35⅞	29	37½
Public Service Co. of Northern Illinois	97	97	104
Puget Sound Power & Light	57	43½	60
Southern California Edison	95	95	106
Tampa Electric	142	134	148
Tennessee Electric Power—no par	38½	20	40½
Virginia Railway & Power	69¾	36	72½
Virginia Power	55	16	55
West Penn. Co.	a 92½	47½	98
Holding Companies			
‡American Electric Power—50	62	22½	62½
American Gas & Electric—no par	74½	43½	74½
American Light & Traction	127	115	136
American Power & Light	283	220	283
American Public Utilities	67	35	67
American Water Works & Electric	a 111	40	115½
Carolina Power & Light—no par	140	103	146
Cities Service	134	134	155
Columbia Gas & Electric—no par	a 42½	33	42⅝
Commonwealth Power Corp.—no par	98	56	98
Consolidated Gas—no par	a 71½	60¾	71½
Continental Gas & Electric	59	49	62
Federal Light and Traction	a 82½	79	84
General Gas & Electric	54	22	54
Lehigh Power Securities—no par	81½	31	81½
Middle West Utilities—no par	52	41	54½
National Power & Light—no par	129	60	140
Philadelphia Co.—50	a 52½	42¾	53½
Power Securities—no par	12½	4	14
Public Service Corp. of N. J.—no par	a 54½	39	55½
Standard Gas & Electric—no par	a 37¼	31½	37½
United Gas & Electric (Conn.)—no par	33	14	42
Utah Securities	a 30½	16¼	31½
BONDS			
Operating Companies			
Adirondack Power & Light	6s 1950	101½	97½ 10 .½
Alabama Power	5s 1946	95	90½ 96
Appalachian Power	5s 1941	94⅜	89 94
Brooklyn Edison	5s 1949	a 101¼	97½ 102½
	6s 1930	a 105	102½ 106
	7s 1930	a 107½	105½ 109
	7s 1949	a 110	108 110
Central Indiana Power	6s 1947	93	88 ››
Commonwealth Edison	5s 1943	99½	95 100
	5s 1953	99¼	92 99¾
§Consol. Gas, Elec. Lt. & Pwr.	4½s 1935	95	91 95
	6s 1949	105	101⅛ 105
	6½s 1951	a 108	107 108½
Consumers' Power	5s 1936	98½	94¾ 99½
Duquesne Light	6s 1949	a 105¼	103½ 106½
Great Western Power	5s 1946	94½	90½ 96
Kansas City Power & Light	5s 1952	a 93¾	89 94
Mississippi River Power	5s 1951	95¾	92 96½
New England Power	5s 1951	98½	97 100
Northern States Power	5s 1941	a 94	89½ 94
	6s 1941	a 103¾	96½ 103¾
Pennsylvania Water & Power	5s 1940	99	96 99½
‡Philadelphia Electric	5s 1966	a 100½	97 101½
	5½s 1947	a 103¾	99½ 103¾
	5½s 1953	a 103½	98¼ 103½
	6s 1941	a 106	103¼ 106½
Southern California Edison	5s 1939	98½	96 99
	6s 1944	102½	100 103½
Cleveland Electric Illuminating	5s 1939	99½	98½ 100½
Detroit Edison	5s 1933	a 101	99½ 101
	5s 1940	a 99	95 100
	6s 1940	a 106	104 106½
Montana Power	5s 1943	a 97¾	95 98
New York Edison	6½s 1941	a 112½	109¾ 112½
Niagara Falls Power	6s 1950	a 105½	104 105½
Ohio Power	7s 1951	106	103 106½
Texas Power & Light	5s 1937	94	91½ 94
Utah Power & Light	5s 1944	a 92½	87½ 93½
Holding Companies			
Alabama Traction, Light & Power	5s 1962	75	65½ 78
American Gas & Electric	6s 2014	95½	94 95½
American Power & Light	6s 2016	94½	91 94½
Amer. Water Works & Electric	5s 1934	a 91½	84½ 92
Commonwealth Power	6s 1948	a 93¾	87 94½
Consolidated Cities Lt., Pwr. & Tr.	5s 1962	71	64 72
Illinois Power & Light	6s 1953	98½	95 99
United Light & Railways	5s 1932	91½	87½ 91½
	6s 1952	96	92 96
ELECTRICAL MANUFACTURING COMPANIES			
PREFERRED STOCKS			
Allis-Chalmers Manufacturing	95¾	90	96¾
*National Carbon	a 122½	115	125
†Wagner Electric	81	77	84
COMMON STOCKS			
Allis-Chalmers Manufacturing	a 53	41¾	53¾
American Bosch Magneto—no par	a 29	22½	38½
Electric Storage Battery—no par	a 57	50¾	64
General Electric	a244	193¾	245½
General Electric—10	11⅞	10½	11⅞
*Hurley Machine—no par	53	48	53½
Manhattan Electric Supply—no par	a 49½	33½	49¾
*Vesta Battery—no par	19	15½	28
†Wagner Electric	24	24	34½
Westinghouse Electric & Manufacturing—50	a 62½	55½	65
Worthington Pump & Manufacturing	26¼	23½	31½
BONDS			
Canada General Electric	6s 1942	a 105½	102½ 105½
General Electric	3½s 1942	82¼	80 82½
	5s 1952	a 103½	100 103½
Robbins & Myers	7s 1952	80	75½ 91½
†Wagner Electric Manufacturing	7s	99½	97 99½
Western Electric	5s 1944	a 98¼	96 98¾
Westinghouse Electric & Mfg.	7s 1931	a 108½	106¾ 109½

*Chicago Stock Exchange. †St. Louis Stock Exchange. ‡Philadelphia Stock Exchange. || Boston Stock Exchange. § Baltimore Stock Exchange.
a Bid price Wednesday, July 16.

General Rise in Public Utility Stock Prices

Spectacular Gains in Certain Securities Mark General Trend—Rise Not Confined to Listed Securities—Growing Familiarity with Stability of Central-Station Industry

DURING the past two weeks electric light and power securities experienced a most interesting rise in prices. Public utility stocks as a whole advanced in price, while the rise of a few bordered on the sensational. Almost without exception the sharpest advances have been traced to rumors involving probable new mergers, attempts to buy control by large interests, or probable expansion in utility business. Behind all of this rumor, however, is the growing familiarity with the worth of electric light and power stocks, the earning power of utilities and the relative stability of the central-station industry.

Perhaps the leader in the sensational rise on the New York Stock Exchange was the common stock of the American Water Works & Electric Company. This stock has sold as low as 40 during the present year, but under the inspiration of rumor the price on July 10 reached 115, an increase over the low of 188 per cent. Large advances have also been made by the participating preferred stock of the West Penn Company, its principal subsidiary.

Heavy buying also took place in the shares of the Philadelphia Company, which seemed to be based on that company's improved earnings position. Another noteworthy advance was in the common stock of the Montana Power Company. In this instance the movement was accompanied by a report of a contemplated consolidation of Northwestern power companies, with the Montana Power as the nucleus, and it also was due to reports of probable early electrification of the Hill railroads, which would mean more business for the Montana Power Company.

The rise was not confined to listed securities, as is instanced by the extensive trading in American Power & Light stocks. The stock of this company moved into new high territory at 285, although it sold around 240 not very long ago.

Merger of Illinois Properties.—An issue of $1,200,000 first mortgage, series A, 6 per cent twenty-five-year gold bonds has been placed on the market by the Kewanee Public Service Company of Illinois. The proceeds from the sale of these bonds will be used by the company to take over the properties of the Consolidated Light & Power Company in Kewanee, Neponset, Sheffield and Galva, Ill., to take over the municipal plant built by the city of Kewanee and to acquire the street railways of Kewanee. The company through its subsidiary, the Kewanee & Galva Railway Company, will also operate a short interurban line.

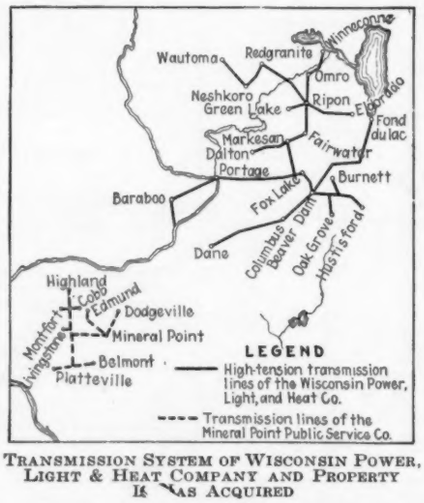
New Stock Issue.—Shareholders of the Northern States Power Company have approved authorization of a new issue of class B common stock. It is planned to issue and sell immediately 500,000 shares of the new stock, to yield $5,000,000, which will be purchased by the interests responsible for the organization and development of the company during the last fourteen years. The balance is to be held for future requirements. The Class B stock will rank after the preferred and the present common stocks as to assets. It will share in dividends with the present common stock after the full 7 per cent dividend is paid on the preferred, in the ratio of 10 cents on each share of class B common for each dollar per share paid on the present common.

Japanese Company to Float Bond Issue in New York

Within a few days it is expected a new offering of $15,000,000 in first mortgage bonds for the account of the Great Consolidated Electric Power Company, Ltd., of Japan will be floated, making another entry by American capital in foreign financing. Practically all equipment used thus far by the Great Consolidated company has been manufactured by either the General Electric Company or the Westinghouse Electric & Manufacturing Company and it is partly for the purpose of raising funds for additional purchases from these manufacturers that the bonds will be placed on sale. The new issue provides for an expansion program which will make the Great Consolidated system the largest in the Japanese Empire.

Merger of Wisconsin Utilities

The holdings of the Mineral Point Public Service Company, which supplies electric light and power service in Mineral Point and numerous other communities in the zinc-lead district of southwestern Wisconsin, have been purchased and consolidated with the interests of the Wisconsin Power, Light & Heat Company, following authority from stockholders, whose action was approved by the Railroad Commission. The transaction involves all property, equipment and contractual obligations in Mineral Point, Dodgeville, Edmund, Cobb, Linden, Montfort, Livingston, Rewey, Eden Highland, Belmont, Clifton, Wingville, Platteville.



TRANSMISSION SYSTEM OF WISCONSIN POWER, LIGHT & HEAT COMPANY AND PROPERTY IT HAS ACQUIRED

Dividends Declared

The following quarterly dividends were announced by central station companies and electrical manufacturing companies during the seven-day period ended July 15:

Name of Company	Per Cent	When Payable
Central Power & Light, pf.	1¾	July 15
Columbia Gas & Electric	65c.	Aug. 15
Commonwealth Gas & Elec., pf.	$1.50	July 15
Dallas Power & Light, pf.	1¾	Aug. 1
Edison Electric Ill. of Brockton	2½	Aug. 1
Electr'c Bond & Share, pf.	1½	Aug. 1
Electric Utilities, pf.	1¼	July 15
El Paso Electric, pf. A	$3.50	July 15
pf. B	$3.00	July 15
Fort Worth Power & Light, pf.	1¾	Aug. 1
Georgia Ry. & Pwr., 1st pf.	2	July 20
Illinois Northern Utilities, pf.	1¾	Aug. 1
Idaho Power, pf.	1¾	Aug. 1
Lowell Electric Light	2½	Aug. 1
Mineral Point Public Service, pf.	1¾	Sept. 15
Northwestern Electric, com.	30c.	July 1
7% pf.	1¾	July 1
6% pf.	1½	July 1
Texas Power & Light, pf.	1¾	Aug. 1
Century Electric Co., com.	1½	June 22
pf.	1¾	July 1

Company Reports

Among the company reports issued during the past week for the month of May are the following:

Name of Company	Gross Revenue for May 1924	1923
American Power & Light	$2,729,346	$2,528,925
Amer. Water Wks. & Elec.	3,142,276	2,992,764
Brazilian Trac., Lt. & Pwr.	2,334,169	2,082,039
Central Power & Light	345,268	282,158
*Georgia Railway & Power	1,323,747	1,284,688
†Manila Electric Corp.	300,963	283,292
City of Tacoma—Lt. Dept.	108,649	108,188
West Penn Company	2,132,869	1,994,231

* Figures as given in July 5 issue were reversed.
† Report for month of June.

Securities Listed.—The board of governors of the New York Stock Exchange has admitted the following securities to the trading list: Kansas City Light & Power Company, 1,000 shares cum. 1st pf., making a total of 11,000 shares listed; Pacific Gas & Electric Company, $5,000,000 common, making a total of $40,632,400 listed; Federal Light & Traction Company, $2,400 6 per cent cum. pf., making a total of $3,779,500 listed; San Antonio Public Service Company, $1,750,000 1st mortgage and refunding gold bonds, 30-year, 6 per cent, series A, due January 1, 1952.

Bonds Called for Redemption.—The Commonwealth Power, Railway & Light Company has called for payment all its outstanding dividend scrip certificates and coupon notes at par and interest on August 1.

Wagner Electric to Redeem Bonds.—The Wagner Electric Corporation has voted to redeem on August 1 $100,000 first mortgage 7 per cent serial gold bonds due August 1, 1926. These bonds are subject to call as a whole or in part on any interest date upon thirty days' notice at a premium of one-half

of 1 per cent for each year or part of year before maturity.

New Control.—The control of the Newport Electric Corporation was transferred to Bodell & Company, investment bankers, on July 7, when that concern paid common stock holders $42 a share on all stock deposited under a recent offer.

Increase in Capital Stock.—Certificate has been filed in the office of the Secretary of State at Albany increasing the capital stock of the Peoples Gas & Electric Company of Oswego, N. Y., from $1,300,000 to $2,000,000 and from 26,000 shares to 40,000 of $50 par value.

Western Union Telegraph Company Earnings Decrease. — The earning report of the Western Union Telegraph Company for the first six months of 1924 shows a gross revenue, including dividends and interest, of $55,128,618, against $56,135,450 for the same period last year. The net income for the same period is given as $6,081,513, against $6,930,034 for 1923.

Bonds Called.—All the outstanding first and refunding mortgage sinking fund gold bonds, series A, dated November 1, 1920, of the Pennsylvania-Ohio Power & Light Company have been called for payment on September 2. All the outstanding general and refunding mortgage 7½ per cent gold bonds, series A, due May 1, 1944, of the Puget Sound Power & Light Company have been called for redemption November 1 at 105.

Sells Bonds for Extensions.—The Wisconsin Valley Electric Company has sold $500,000 in par amount of its first mortgage 5½ per cent bonds on a basis to yield 5.6 per cent. The proceeds of the issue are to be used in completing the construction of its new dam and power plants, known as Alexander Dam, on the Wisconsin River, and to complete the construction of a 44,000-volt line from Merrill to Tomahawk, Wis., a distance of 26 miles.

Consolidated Power & Light Company Sold.—The Paul C. Dodge Company and the True Webber Company of Chicago have purchased the properties of the Consolidated Power & Light Company of Bellefourche, S. D. The purchase includes the steam power plant at Pluma, the hydro-electric station in Redwater Creek, distributing systems to the towns of Bellefourche, Sturgis, Newell, Nisland and Fruitdale and the transmission lines to the Black Hills district.

Illinois Merger.—The Illinois Power & Light Corporation has announced the purchase of the municipal power plant at Columbia, the power plant of the Cerro Gordo Electric Company at Cerro Gordo and the power plants of the Argenta-Warrensburg Electric Company at Argenta and Warrensburg, all in Illinois. The plant at Columbia will be discontinued, but the three other plants will be operated as a part of the Decatur division of the Illinois Power & Light Corporation.

Brief News Notes

A. E. S. to Hold Fall Meeting in Detroit.—The fall meeting of the American Electrochemical Society is to be held at Detroit on October 2, 3 and 4. Electrolytic refining, corrosion, refractories for electric furnaces, industrial electric heating, electric furnace cast iron and analytical methods in electrodeposition will be subjects of symposiums or round-table discussions.

Canadian Engineers Investigating Power Resources of Ottawa River.—Engineers of the Ontario Hydro-Electric Commission under Chief Engineer F. W. Clark have commenced a survey of the upper Ottawa river, where considerable development work is likely to be started in the near future. The engineers are to ascertain the available power, take levels, obtain data on the construction of a dam and all other facts necessary. This preliminary survey will require the rest of the summer to complete.

Summer Conference for Engineering Teachers Held at Westinghouse Plant.—Thirteen professors and instructors of various universities and colleges are attending the fourteenth annual session of the Summer Conference for Engineering Teachers, which is being held at the works of the Westinghouse Electric & Manufacturing Company from July 7 to July 31. The program for the conference is worked out so that each member is afforded an opportunity to carry out some line of engineering work. Among the colleges represented in the conference are the University of Kansas, University of Colorado, New Mexico Agriculture and Mechanics College, Alabama Polytechnic Institute, Harvard Engineering School, Cornell University, University of Iowa, Oregon Agricultural College, Brooklyn Polytechnic Institute, Purdue University and the Victoria Jubilee Institute of Bombay, India.

Plan to Raise Level of Great Lakes and Increase Water-Power Possibilities.—The Ontario Hydro-Electric Commission has under consideration a report submitted by Ralph Keemle proposing that rivers now flowing into James Bay be diverted into Lake Superior. Mr. Keemle, who was formerly locating engineer for the Canadian Northern Railway and is now general manager of the Wallaceburg & Lake Erie Railway Company, claims that the water level of the Great Lakes could be raised from 8 in. to 12 in. by the diversion of portions of the Albany, Ogoki and Kenogami Rivers, which now flow into James Bay, to empty in Lake Superior. By the construction of three dams it is proposed that these waters be made to flow into Nipigon Lake and from there into Lake Superior. It is estimated that the cost would be between five and six million dollars and that as a result the drainage from about 17,000 square miles which now flows north would flow south. This increase would, it is asserted, permit the development of an additional 500,000 hp. of electrical energy. The project has been favorably reported on by the hydro engineers and is now before the commission.

State of Colorado Moves Against Projected Loveland Municipal Plant.—The State of Colorado has joined the Public Utilities Commission in seeking an injunction to restrain the city of Loveland from erecting a municipal electric plant despite the refusal of the commission to grant it a certificate of convenience and necessity, this action of the commission being based on the ground that residents of the town are getting good service from the Public Service Company of Colorado at lower rates than could be made by a municipal plant. A protracted legal battle over the powers of the municipality under Colorado law is likely.

Progress on Quebec Dams.—Plans for the construction of storage dams on the Ste. Anne de la Perade River, the Rivière du Loup and the Rivière du Nord are now under review by the Quebec Running Streams Commission, and preliminary work may start next spring or in the fall. While these projected works are under study the two-million dollar dam at Kenogami has progressed so satisfactorily that it will be finished late this fall. It is asserted also that through the damming of the Chicoutimi and Des Sables Rivers the flow of these two watercourses will be regulated and the power increased from about 50,000 hp. to 150,000 hp.

Bridge River Power Project Being Surveyed by British Columbia Engineers. — Development of the Bridge River power project near Lillooet, B. C., is under consideration. Two survey parties sent by the British Columbia Electric Railway are now in the field. Their examination of the power in the Bridge River district is following the personal tour of the project by one of the leading engineers of the British Columbia Electric staff. According to government reports and surveys of the Bridge River Power Company, the power available is one of the most extensive in the province. Estimates run from 100,000 to 400,000 hp.

Progress of Minnesota's Experimental Farm Line.—Farmers on the experimental electric line constructed last fall out of Red Wing, Minn., are finding many unexpected uses for electrical energy, according to Prof. E. A. Stewart, who is in charge of the project. This line, it will be remembered, was built under plans developed by the national Committee on the Relation of Electricity to Agriculture, in co-operation with the State Farm Bureau, State Agricultural College and Minnesota power companies. Eleven farms and one school house are now being supplied. Eight homes have been supplied with electric fixtures for lighting purposes. Seven electric washing machines, three electric incubators, three electric brooders, three electric vacuum cleaners, five electric ranges, two electric

pumps, four electric separators and five motors rated at from 3 hp. to 5 hp. are being operated on the line. Orders have been placed for twenty-five additional pieces of equipment, which will be installed soon.

Minneapolis Saves Money by Substituting Electricity for Gas.—City authorities of Minneapolis say that the 1925 budget for street lighting will probably be $20,000 less than the 1924 budget and that even with this reduction it will be possible to operate 800 more lamps than were in service at the beginning of this year. The change from gas to electricity has effected this saving besides greatly improving the illumination. A municipal study of the amount of street illumination necessary to minimize traffic accidents is to be carried out.

American Physical Society's California Meeting.—The one hundred and twenty-eighth regular meeting of the American Physical Society was held at Stanford University, California, June 25 to 28 in affiliation with the Pacific Coast Division of the American Association for the Advancement of Science. Dr. David Starr Jordan of Stanford delivered the presidential address on "Science and Sciosophy," and Prof. George H. F. Nuttall of Cambridge University spoke on "Symbiosis." Thirteen papers by notable physicists were delivered. The next Pacific Coast meeting of the society will be held at the California Institute of Technology in February, 1925.

St. Louis to Oshkosh and Keokuk to Logansport Are Newly Completed Interconnections.—Of more than ordinary interest is the recent closing of a gap in the fast-growing interconnected system of the Middle West which had existed between Freeport and Lena, Ill. It has been bridged by the Illinois Northern Utilities Company, and by its means large steam plants in Illinois are directly interconnected with the hydro-electric generating stations of the Middle West Utilities Company in Wisconsin. Energy may now be transmitted between St. Louis and Sheboygan, Oshkosh and many other Wisconsin cities or it may be sent from Keokuk, Iowa, to Loganport, Ind., or vice versa.

Thirty-nine Towns and Villages to Be Linked in Central New York.—The New York Central Electric Corporation is planning to extend its lines in the towns of Ossian and Sparta, Livingston County; Reading, Schuyler County; Bath and Wayland, Steuben County; Middlebury, Wyoming County, and the village of Almond, Allegany County. All of these places will be linked together, with thirty-nine other towns and villages in the same region, into one big distributing system that will have several sources of power available, including Niagara. Hornell will be an important point in the system, and a large steam plant is to be situated there. The corporation was organized less than two years ago to take over the property, franchises and assets of existing companies and to promote new electric power projects.

Two Units of the New Des Moines Plant to Be Completed Next Year.—It is expected that the first two units of the new power station of the Des Moines (Iowa) Electric Company, which was briefly described in the ELECTRICAL WORLD for February 16 last, page 351, will be finished within a year. They will have a joint rating of 40,000 kw., and the initial expenditures to the plant will be about $6,000,000. It will have a possible ultimate capacity of 100,000 kw. or more, to install which would involve an additional $10,000,000. One notable feature of the station will be an under-water storage pit which will contain 50,000 tons of coal and can be enlarged to hold 150,000 tons in case it is desirable.

South Dakota Properties Change Hands.—The Paul C. Dodge Company and the True-Webber Company of Chicago have purchased the properties of the Consolidated Power & Light Company of Deadwood, S. D. The purchase includes a steam plant at Pluma, a hydro-electric station on Redwater creek, distributing systems to the towns of Bellefourche, Sturgis, Newell, Nisland and Fruitdale and a transmission line to the Black Hills district. The same companies purchased the property of the Dakota Power Company at Rapid City in the latter part of 1923. Lee Boyer, vice-president and general manager of the Consolidated Power & Light Company, is expected to remain with the new company.

Coming Meetings of Electrical and Allied Societies

[A complete directory of electrical associations is published in the first issue of each volume. See July 5 issue, page 50, for latest list.]

Pacific Coast Electrical Supply Jobbers' Association—Del Monte, Cal., July 24-26.

Conference of Electrical Leagues, Association Island, Henderson Harbor, N. Y., Sept. 2-6. Address Society for Electrical Development, 522 Fifth Avenue, New York.

Pennsylvania Electric Association—Bedford Springs Hotel, Bedford Springs, Pa., Sept. 3-6. H. M. Stine, 212 Locust St., Harrisburg.

Association of Edison Illuminating Companies—Griswold Hotel, New London, Conn., Sept. 8-12. P. S. Millar, 80th St. and East End Ave., New York.

Michigan Electric Light Association—Detroit, Sept. 9-11. Herbert Silvester, Edison Bldg., Ann Arbor, Mich.

New England Division, N. E. L. A.—Hotel Wentworth, Portsmouth, N. H., Sept. 10-13. Miss O. A. Bursiel, 149 Tremont St., Boston.

Rocky Mountain Division, N. E. L. A.—Hotel Colorado, Glenwood Springs, Col., Sept. 15-17. O. A. Weller, 900 15th St., Denver.

Colorado Public Service Association—Denver, Sept. 15-17.

Southeastern Division, N. E. L. A.—Birmingham, Sept. 15-18. E. T. O'Connell, Alabama Power Co., Birmingham.

Association of Iron and Steel Electrical Engineers—Pittsburgh, Sept. 15-20. J. F. Kelly, 513 Empire Building, Pittsburgh.

Great Lakes Division, N. E. L. A.—French Lick, Ind., Sept. 24-27. R. V. Prather, Illinois Mine Workers' Bldg., Springfield, Ill.

Association of Electragists International—West Baden Springs, Ind., Sept. 29-Oct. 4. L. W. Davis, 15 W. 37th St., New York.

Pan-American Electrical Pact Drafted.—The subcommission on legislation and convention of the Inter-American Electrical Communications Congress at Mexico City has finished its draft of a convention establishing new international principles regarding tariffs and traffic and certain regulations for handling electrical correspondence, providing for unification of the various radio and wire systems. The sub-committees on traffic accountancy, tariffs, wires and submarine cables are also finishing their work, all tending to bring about uniformity in electrical communication on the American continents. It is reported that all the countries represented except the United States and Argentina voted for a single convention to cover all points.

Relative Number of Customers Served by Large Ohio Central Stations.—Although 225 electric light and power companies are now reporting to the Public Utilities Commission of Ohio, eleven serve more than 70 per cent of the state's light and power users. These eleven companies and the number of customers supplied by each on January 1, 1924, are listed as follows:

Company	Customers Served
Cleveland Electric Illuminating Company	213,829
Union Gas & Electric Company (Cincinnati)	93,432
Ohio Power Company (Canton, Newark, Steubenville, Fremont, etc.)	84,112
Toledo Edison Company	62,610
Dayton Power & Light Company	62,045
Columbus Railway, Power & Light Company	57,123
Northern Ohio Traction & Light Company (Akron)	48,328
Ohio Public Service Company (Lorain, Alliance, Massillon, Mansfield, Elyria, etc.)	44,652
Pennsylvania-Ohio Electric Light Company (Youngstown)	34,948
Ohio Service Company (Coshocton, New Philadelphia, etc.)	16,093
Springfield Light, Heat & Power Company	13,178

Italy's Great Investment in Water-Power Development.—Italy's present capital investment in water-power development exceeds three billion lire, which is four times the amount so invested at the outset of the World War and a full billion lire more than 1922, according to statistics recently published. The figures for 355 companies account for a little under half of the energy available in the country and indicate a total share of capital of 2,148,000,000 lire and bonds amounting to 13,000,000 lire. Last year's profits from operation of 131 of these companies produced an average dividend of 6¾ per cent. To date 2,250,000 hp. has been developed from a total potential energy ranging from 5,000,000 hp. to 8,000,000 hp. Development is reported to be going on all over the country, but the north, where most of Italy's industries are located, leads with its four big operating groups. The Edison di Elettricita, in Lombardy, with a capital of 180,000,000 lire, is linked up with the Credito Italiano and is the biggest producer of electric energy in the kingdom. In Piedmont the Sip-Alta Italia, with a capital of 200,000,000 lire is the chief producer. The annexed provinces of Trentino, Venetia and Delmatia are the field of the Adriatica Elettricita with a capital of 100,000,000 lire.

Men of the Industry

Changes in Personnel
Accomplishments, Responsibilities, Honors, Appointments and Activities of Men Engaged in All Branches of the Electrical Industry

F. M. Farmer Elected President of A. S. T. M.

F. M. Farmer, chief engineer of the Electrical Testing Laboratories, New York, was elected president of the American Society for Testing Materials at the recent convention held in Atlantic City.

Mr. Farmer brings to the presidency of the association a broad knowledge resulting from years of experience in industrial research, testing and inspection of electrical engineering materials and apparatus in addition to a thorough familiarity with the activities of the association, with which he

F. M. FARMER

has been identified for several years. During this period he has served as chairman of the committee on electrical insulating materials and of the committee on rubber products, as well as on the executive committee in 1921 and as vice-president in 1923 to fill an unexpired term.

Born at Ilion, N. Y., in 1877, Mr. Farmer was educated at the Ilion Academy and Cornell University, from which he was graduated in 1899 with the degree of M.E. He spent two years with the General Electric Company, two years with the Navy Department as inspector, and for the past twenty years has been associated with the Electrical Testing Laboratories. He is a fellow of the American Institute of Electrical Engineers and a member of the American Society of Mechanical Engineers, the Institution of Electrical Engineers (British) and other engineering organizations. He has been active on committees, including the board of examiners, standards committee and transmission committee of the A. I. E. E., and has contributed numerous technical papers to society proceedings. He is the author of "Electrical Measurements in Practice," an associate editor of the American Civil Engineers' Handbook and a contributor to the Standard Handbook for Electrical Engineers.

William Marconi, wireless inventor, has been appointed president of the Italo Radio Company, Rome, which organization has also large interest in radio societies in South America.

J. H. Rudd, assistant business manager of the ELECTRICAL WORLD and the *Industrial Engineer*, has been appointed acting business manager of these publications.

Edgar Kobak, business manager of the ELECTRICAL WORLD and the *Industrial Engineer*, published by the McGraw-Hill Company, has been appointed assistant vice-president of that company, acting as assistant to the vice-president in charge of the electrical publications.

William C. Bell, chief engineer of the Virginia Railway & Power Company, Richmond, Va., has been appointed chief engineer and general manager of the light and power system of the company by President Thomas S. Wheelwright. Mr. Bell has been associated with the organization since 1911.

Frederick R. Low, for the past thirty-six years editor of *Power*, a McGraw-Hill publication, has been made an honorary member of the Institute of Mechanical Engineers (British). Mr. Low is president of the American Society of Mechanical Engineers and is at present abroad, where he went as the association's delegate to the World Power Conference.

Prof. Elihu Thomson was formally presented with the Lord Kelvin gold medal on July 10, at the World Power Conference meeting in London. Sir J. J. Thompson made the address on behalf of the Kelvin Centenary Committee. Details concerning the award appeared in the January 12 issue of the ELECTRICAL WORLD. Another recent honor conferred on Professor Thomson was the degree of doctor of science given by the University of Manchester, England, on July 14.

B. S. Jerman was recently elected president of the Carolina Power & Light Company, Raleigh, N. C., by the board of directors, to succeed the late Charles E. Johnson. Since Mr. Johnson's death Paul Tillery, vice-president and general manager, has been directing the company's affairs. Mr. Jerman is president of the Commercial National Bank in Raleigh. He is not without experience in the public utility business, having organized and served as president of the Standard Gas & Electric Company, which held the original Raleigh franchises but sold its business in 1909 to the Carolina Power & Light Company. Mr. Jerman was also elected president of the Yadkin River Power Company, a subsidiary.

D. E. Parsons Resigns

D. E. Parsons, since 1916 general manager of the East St. Louis (Ill.) Light & Power Company, has resigned, effective August 1, to affiliate himself with the Railway & Industrial Engineering Company, Greensburg, Pa., manufacturer of outdoor substations, outdoor lightning arresters, switches and choke coils.

The posts which Mr. Parsons will relinquish include the general managership of the East St. Louis & Suburban Railway, East St. Louis Railway, St. Louis & Belleville Electric Railway and the St. Louis & East St. Louis Electric Railway as well as of the East St. Louis Light & Power Company. He became identified with the electrical utilities in East St. Louis eight years ago after bringing to a close a period of service with the Westinghouse Electric & Manufacturing Company covering twelve years.

His association with the Westinghouse company began in 1904 when he entered its two-year apprenticeship

D. E. PARSONS

course. After serving in the sales department for a short time he was promoted in 1906 to the position of head of the export division, and in 1908 he represented the mining department in the sales organization at the branch office of the company in Fairmont, W. Va. Subsequently he was appointed representative of the railway and lighting department in the Pittsburgh office, resigning in 1916 to go to East St. Louis.

Mr. Parsons is a native of Huntington, W. Va., and a graduate of the Marshall College Preparatory School of that city. He entered West Virginia University and was graduated from the mechanical engineering department of that institution. He has been active in the affairs of the electrical associations of Illinois, being a past-president of both the Illinois State Electric Association and of the Illinois Electric Railways Association.

Sir Ernest Rutherford Cavendish, professor of physics in Cambridge University, is this year's recipient of the Franklin medal and certificate of honorary membership in the Franklin Institute, Philadelphia, Pa. The award was formally made on July 14 in Lon-

don by Charles Trevelyan, president of the Board of Education, in the presence of a number of distinguished persons in recognition of the English scientist's achievements in research work in physics.

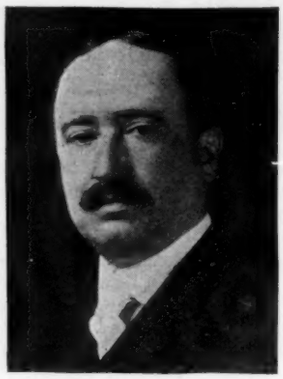
Carl A. Wolfrom, formerly manager of the Utah Power & Light Company's Idaho Falls division, has been appointed manager of the Provo division, with headquarters at Provo, Utah. Mr. Wolfrom has had many years' experience with the company, having first become associated with the Telluride Power Company, the predecessor of the Utah Power & Light Company, in 1902, as operator and plant superintendent of the Provo and Olmsted plants. He has steadily advanced into the more responsible positions and for the past six years was in charge of the company's Idaho Falls division.

William A. Durgin, who for two and a half years has been at the head of the division of simplified practice of the Department of Commerce, has left his government activity to resume his former post with the Commonwealth Edison Company of Chicago, from which he was borrowed by Secretary of Commerce Hoover when the latter established the division of simplified practice to help industry eliminate waste through the reduction of excess varieties. He is being succeeded by Ray M. Hudson, who has been assistant chief of the division since it was created.

J. C. Plankinton, best known through his ten years of electrical work in the Hawaiian Islands, became sales manager of the Northwestern Electric Company at Portland, Ore., on July 1. Mr. Plankinton has been placed in charge of all commercial activities of the company and because of his wide experience both as engineer and salesman he should prove a strong addition to the force. After spending two years at Schenectady with the General Electric Company following his graduation from the Oregon Agricultural College in 1910, Mr. Plankinton was transferred to Honolulu as sales engineer with Catton Neill & Company, representatives of the General Electric Company in Hawaii and the Philippines. This position he held until 1916, when he was selected as manager of the Hilo (T.H.) Electric Light Company. Since 1923 he has been engaging in electrical work on the Pacific Coast.

W. H. Thornley New President of Associated Manufacturers

William H. Thornley, who was elected president of the Associated Manufacturers of Electrical Supplies at the convention held recently in Atlantic City, as was announced in the June 28 issue of the ELECTRICAL WORLD, entered upon his career as a corporation lawyer, being a graduate of Brown University and the Harvard Law School. He is still primarily of the legal profession, but through his connection with various estates and as advisory counselor he became an active part of various manufacturing industries themselves. It was twelve years ago that Mr. Thornley established contact with the electrical industry when



W. H. THORNLEY

he was made president of the Tubular Woven Fabric Company, Pawtucket, R. I., which office he occupies at the present time. In addition, Mr. Thornley is an officer or director in many other organizations, including the National Bank of Commerce, the Hope Publishing Company, the Narragansett Machine Company, the Rhode Island Co-Operative Coal Company, all of Rhode Island, and the Lisk Manufacturing Company, Canandaigua, New York, and the Gerry Estate of New York City.

R. M. Boykin New President of Northwest Association

Richard M. Boykin, manager of the Southern Division of the Puget Sound Power & Light Company, with office in Portland, Ore., was recently elected to the presidency of the Northwest Electric Light and Power Association. Mr. Boykin has for a number of years taken an active part in electrical matters in the Northwest and his wide acquaintance and broad experience fit him for the work particularly well.

After receiving the degree of B. S. in electrical engineering in 1897 from the school now known as the Alabama Polytechnic Institute, Mr. Boykin immediately started electrical construction work, including motor installations in cotton mills in South Carolina. Several years were spent in Philadelphia as shop foreman with the American Press Steel Pulley Company and in 1906 he went to Tonopah, Nev., where he assisted in the distribution of large blocks of electrical power in and about the great metal mines. The year 1911 found Mr. Boykin in Oregon as the owner and operator of the electrical system at Hillsboro. This system he developed, and when it was merged with the Washington-Oregon Corporation he became superintendent of construction. In 1914, when a receiver was named, Mr. Boykin was appointed engineer and upon the organization of the North Coast Power Company was appointed general manager, elected to the board and made vice-president of the company.

R. M. BOYKIN

In 1924 the North Coast Power Company was absorbed by the Puget Sound Power & Light Company, with Mr. Boykin as manager of the Southern district. In the local section of the American Institute of Electrical Engineers he has served with credit in many capacities, as well as on committee work in the Northwest geographic division of the N.E.L.A., including the chairmanship of the overhead systems committee and technical section.

Obituary

Arthur S. Page, for several years a member of the engineering department of the Central Maine Power Company, died at Waterville, Me., July 10, following an operation. He was forty-six years of age and was a graduate of the University of Maine.

George Davis, an engineer in the mechanical maintenance department of the Utica (N. Y.) Gas & Electric Company, was instantly killed July 5 when he came in contact with a 22,000-volt wire at the Washington Street station of that company. Mr. Davis was thirty-two years of age.

Edward F. Latimer, superintendent of construction for the Narragansett Electric Lighting Company, Providence, R. I., died recently while in apparent health at his home in Edgewood, R. I. Mr. Latimer was sixty-two years of age and had been with the Providence company since 1913, when he was appointed superintendent of line construction. In his earlier career he was engaged in power plant work with the Derby (Conn.) Gas Company, later being employed as supervisor of erection for the McIntosh & Seymour Engine Company, Bridgeport, Conn., and by the Waterbury (Conn.) Traction Company. For four years he was on the staff of the United Gas Improvement Company of Baltimore, Md., and for a time was employed by the Southern New England Telephone Company.

John Graeme Balsillie, radio and electrical engineer of Melbourne, Australia, died on July 10 in Cincinnati, Ohio, after an illness of several weeks. Mr. Balsillie, who was formerly director of radio of the Australian government, came to the United States recently in the interest of an invention.

Commission Rulings

Deferred Maintenance of Joint Property.—The Eesley Light & Power Company, which was required at irregular intervals to meet a considerable deferred maintenance charge arising from a jointly owned water-power development, was required by the Michigan Public Utilities Commission to take certain charges partly out of the depreciation reserve accrued against the water-power property and to meet the charge partly by separating accruals in a deferred maintenance account so that the operating results of each year or any year might not be unduly distorted because of exceptional work on the water-power development. The commission said that such deferred maintenance account would not cause any increase in the expense concerned, but would only distribute it uniformly.

Putting Rural Rates on Monthly Basis Inadvisable. — In fixing rural rates for the Coast Valleys Gas & Electric Company the California Railroad Commission said of the existing rate: "This rate is not only exceedingly complicated, but, being upon a monthly basis, causes dissatisfaction among consumers whose operations are governed by crop and weather conditions and whose bills are unnecessarily increased whenever operations that might fall within one month cover portions of two arbitrary billing periods." A new type of schedule designed to eliminate the objections to the agricultural rates was put in force. The new rates provided for the ownership and maintenance of transformer equipment by the company instead of the consumers.

Sealing of Meter Boxes.—A complaint against the action of an electric light company in sealing a meter box furnished by the owner of property was dismissed by the Pennsylvania Public Service Commission in a case concerning the Luzerne County Gas & Electric Company. The commission held that the installation of the box by the property owner and the sealing and control thereof by the company was in accordance with standard modern practice, asserting: "The sealing of the box does not conceal the dials of the meter or prevent the reading of the meter by the consumer; its only purpose is to protect the meter against being tampered with. In these circumstances the commission is not convinced that a rule which is intended to provide against this is either unjust or unreasonable. The complainant, however, does not question the justness and reasonableness of the rule, but bases her contention on the sole ground that the cut-out box is her property and that the company has no right to assume control of it. Where, as here, the justness and reasonableness of the company's rule is conceded, it cannot, in the opinion of the commission, be defeated by an academic discussion of property rights. The question of who should install or own the cut-out box is neither raised by the pleadings nor the evidence submitted and consequently is not an issue in this proceeding. The evidence clearly establishes the necessity for protecting the company's meter from being tampered with and that the rule adopted for this purpose is a just and reasonable one."

Disputes Over High Bills.—The New Jersey Board of Public Utility Commissioners, disclaiming authority to settle a dispute between the Middlesex Water Company and one of its customers over a bill for an apparently unexplained increase in consumption, said that, since the reasonableness of the rate was not challenged, but only the amount of water charged for, the case was one for the courts. The board, however, forbade a discontinuance of service in the attempt to enforce payment. It made this comment: "To require bills to be rendered on customers' estimates of use, instead of the registrations of accurate meters, would result in a chaotic condition in the relations between public utilities and their customers. This of course does not mean that complaints alleging overcharge should not be investigated and errors, if found, corrected."

Recent Court Decisions

Legal Aspect of Commission Order Affecting Disputed Water Rights.—The International Paper Company and others appealed from an order of the New Hampshire Public Service Commission granting the Dummer Power Company permission to erect a dam for the generation of electric power. The appellants alleged that the petitioner was not the owner of the land where it proposed to erect the dam, nor had it the consent of the owners so to do; that the erection of the dam was prohibited by the statute under which the proceeding was brought, and that it would not be of public use and benefit to grant the rights asked for. The Supreme Court of New Hampshire held that the first two objections were not material, since if the power company was seeking, as implied, to obtain rights owned by the paper company, this question will arise when the former company seeks to acquire these rights by assessment and without assessment and payment they cannot be taken. Concerning "public use and benefit" the court said: "It is conceded in argument that the object for which the petitioner proposes to employ the power obtained by raising the water level of the stream is a public use under the statute and the authorities. The argument is that it will not be of public benefit now to permit such taking. The principal contention in support of this claim rests upon the fact that there is very little fall, if any, upon the land which the petitioner claims to own or control and that the dam proposed, if built, will merely flow out a portion of a fall, all of which belongs to the appellants. Whether the appellants power should be held intact and developed at some time as a single unit instead of the partial development proposed at this time depends upon many facts evidence as to which was laid before the commission. The evidence does not lead the court to the conclusion that the finding which has been made by the commission is erroneous. (124 At. 556.)*

Federal Court Upholds Right to Judicial Review. — The United States District Court for the Southern District of Ohio held, in Van Wert Gas Light Company vs. Ohio Public Utilities Commission, that a public utility company is entitled to a full inquiry into the fact of confiscation, including the question of a true valuation of its property, in an injunction proceeding in a federal court, nothwithstanding the fact that the Supreme Court of a state has approved the valuation upon which rates have been based by the state commission, if it appears that a full judicial inquiry was not made by the court and that no federal question existed at the time of the judicial proceedings. In this decision the court followed holdings of the United States Supreme Court in the Bluefield Water Works and Ohio Valley Water Company cases, where it was held that a court which failed to determine the question of confiscation according to its own independent judgment, when the action of the commission came to be considered on appeal, thereby failed to grant the judicial review that constitutes due process of law.

Instruction to Jury Tantamount to Directed Verdict for Plaintiff in Fatality Case Not Erroneous.—A lineman employed by the Kansas City Light & Power Company met his death from contact with an uninsulated wire while in discharge of his duties. His widow brought suit (Clark vs. Kansas City Light & Power Company), and the trial court instructed the jury in a manner tantamount to directing a verdict for the plaintiff if the facts were found as stated by her. Appeal was taken to the Kansas City Court of Appeals, which has affirmed the verdict, holding that the trial judge's charge did not ignore issues tendered by pleadings or enlarge same, or ignore pleadings and proof of contributory negligence, assumption of risk, evidence of instructions and warnings to deceased and proximate cause, or broaden issues tendered by requiring of defendant exercise of highest degree of care, or ignore deceased's knowledge of conditions. The Court of Appeals specifically held that the instruction was not calculated to mislead the jury by telling them it was the duty of defendant to protect its wires by insulation "or otherwise." "It is defendant's duty under the law," the higher court said, "to protect its wires, and whether this protection is accomplished by insulation or otherwise is immaterial here." (261 S. W. 752.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Manufacturing and Markets

To Cure the Evil in the Fixture Industry

Analysis of the Weak Spot in the Fixture Business Made by the Fixture Manufacturers' Association—Bureau for Patent Protection Set Up

THE National Council of Lighting Fixture Manufacturers through its committee on patents has made an extensive survey and study of the conditions of the fixture industry with particular attention to the causes of and possibilities for relief from the conditions of destructive competition that for so long have hampered the progress of the business and the development of the fixture market on a sound basis of stability. The report of the committee, submitted at the recent convention of the association in Atlantic City, analyzes the situation as follows:

Design Protection Vital

A study of the lighting equipment trade reveals the following fundamental factors:

1. The industry is based on design and mechanical invention. Competition, therefore, between the various members of the industry logically should be primarily a competition based upon design; secondarily, a competition based upon quality price.

2. The industry does not follow this logical course. It is suffering from an artificial disarrangement. Manufacturers generally do not protect themselves against copying and imitating. Consequently, a new design or invention, if popular, quickly finds its way into cheap imitations and eventual overproduction, which practically ruins it as a salable, profitable article both for the originator and for the subsequent imitators. (Witness the trend of "showers," "body fixtures," etc.) Economically this condition is unsound and reacts upon the entire industry.

3. The lighting equipment trade is divided into strata. These may roughly be designated high grade, medium grade and low grade. A new design created in one field which finds its way through imitation and the use of cheaper materials and construction into a lower grade seriously affects its salability in the field of origin. The disruption thereby caused is a costly burden because it demands the maintenance of overly large designing departments to replace the spoiled designs. The cost of producing fixtures is made abnormally high through the unnatural overhead thus created.

4. Any condition which permits one manufacturer to appropriate the property rights of another lacks justice. It precludes fair competition, which is one of the prime laws of business. The lighting equipment industry is structurally weak because it now rests upon an unstable foundation, the chief characteristic of which is this very element of injustice.

5. The progressive and constructive efforts of the National Council have not received as much enthusiastic support as they deserve because the condition outlined above acts as a deterrent. Manufacturers are reluctant to finance advertising campaigns and central markets so long as these movements tend to create larger markets for concerns which with impunity are able to and do secure the essential elements of their line by copying and imitating.

Cost of Patent Suits

6. The patent laws provide means whereby manufacturers may protect their designs and mechanical inventions, and in cases where the law has been invoked the results generally have been successful. However, the cost of securing the necessary legal assistance, first, in obtaining valid patents (both design and mechanical), and, second, in protecting such patents in the courts in many cases is prohibitive. What is perhaps more important is the uncertainty as to the ultimate cost of a case in court. Instances have been found in which litigation has cost each side $25,000 or more, without computing the loss of time of the principals and their employees. Consequently members of the industry as a rule have held to the principle "stay away from litigation" because they have preferred to suffer the certain loss involved in piracy rather than incur the uncertain cost of a legal battle.

7. There is no basis which would warrant confidence that any plan of protection would succeed which depends upon agreements, pools or other schemes of similar character.

Central Authority Needed

These factors lead to the following conclusions:

1. The ultimate stability of the lighting equipment industry and its successful growth and strength depend upon protection of original designs and mechanical inventions. This is the keystone.

2. Such protection must be of a legal character based upon United States patents.

3. The cost of such protection must be reduced to a definitely known factor and must bear a reasonable relation to the volume of each concern's business.

4. The work of protection must be placed in the hands of some central authority who not only must be competent but must also be independent of any commercial interest in the industry, thereby commanding the confidence of its members in the unbiased judgment of such authority.

5. If this problem can be solved successfully the entire complexion of the industry will be changed materially and a great stride forward will have been taken.

Patent Bureau Set Up

As a method of remedying the situation, by making available to all members of the association, small and large, privileges of protection, which now are possible only to the stronger concerns, a bureau has been created for the purpose of safeguarding original inventions and designs belonging to participating members.

The functions of the Lighting Equipment Patent Bureau, as it is called, will be as follows:

(a) To furnish reliable opinions, based upon search of available patent records and other data, as to the originality and patentability of any design or invention.

(b) To prepare papers of application for U. S. Letters Patent or U. S. Design Letters Patent, and to attend to all the routine necessary to secure them.

(c) To render opinions upon alleged infringements of patent rights.

(d) To attempt by negotiation to adjust conflicts between patent rights of participating members on the one hand and infringements on the other, leading toward either the discontinuance of actual infringements or the granting or obtaining of licenses for value by the patentees or their assignees.

(e) To prosecute or define suits on behalf of participating members who, in the opinion of the bureau, are injured parties in cases of patent infringement, whether such members be plaintiffs or defendants.

(f) To create and maintain suitable files and records.

(g) To furnish opinions of a general character pertaining to patent work relating to the lighting equipment industry.

(h) To prepare license contracts, assignments, agreements and other legal documents necessary properly to protect the patent interests of participating members.

(i) To furnish copies of patents and generally to assist participating members.

The personnel of the committee on

patents, by which the investigation was made and the plan for the patent bureau developed, was J. W. Schulze, chairman, president Alfred Vester Sons, Inc.; William Kettering, secretary Friedley-Voshardt Company; Percy I. Ansorge, president Empire Lighting Fixture Company.

The program was adopted in its entirety by the association and is expected to bring great benefit to the lighting fixture industry. Under this plan a central patent bureau in charge of a firm of patent attorneys will handle matters of dispute without litigation. Disputes will be argued before the bureau and the petitioner can, of course, later take his grievance to the courts should he desire. The fixture manufacturers will finance the bureau by subscribing amounts based on their volume of sales, which will cover all expenses of filing and securing patents. The limit of expense in any case before the bureau will be $500.

Are We Overdoing High-Tension Selling?

Absorption of Appliances Unnecessarily Slow—Too Much Stimulation Dragging Retail Selling—Saner Merchandising Is the Cure

BY FRANK J. GOTTRON
General Manager the P. A. Geier Company, Cleveland, Ohio

THE distribution of electrical appliances has never reached its true level. The country can and should absorb more washers, more ironers, more vacuum cleaners, than it does. It should be absorbing dishwashers at a rate ten times the present sales.

Those who are spending their lives in meeting this problem of insufficient appliance distribution are not agreed as to the cause and cure of the trouble. John Gilchrist maintains that wider margin is needed between manufacturers' selling prices and the established prices at which appliances are sold to the public. Others take the stand that the channels of distribution are clogged with inefficient and unintelligent dealers, whose activity and ability would not be increased by adding to their spread even if that were practicable. Some maintain that the prices to the public are too high; others point out that the higher priced appliances are selling as well as those priced presumably at more "popular" figures. Some maintain that the secret of more rapid sales is manpower, as exemplified by campaign activities, by the employment of more house-to-house salesmen, or by utilizing the services of itinerant crews of sales mercenaries trained and provided by the manufacturers; others that the high pressure methods have defeated themselves. I am among those who hold this latter view.

F. J. GOTTRON

EFFECT OF STIMULANTS

The constant use of stimulants, the doctors tell us, soon defeats the purpose for which stimulants are intended. A "shot" of whatever sort may be desirable or even necessary in emergency, but repeated dosage results in an inability to function normally. It develops addiction. This is true also of business. Give stimulants regularly to a business, or to a department of a business, or even to a single item of the stock in trade of that business, and you will soon have a business, department or item which will only move when stimulated. Between doses it is virtually dead.

Something like this has happened as regards electrical appliances. Campaigns, schemes, high-pressure methods, all manner of sales stimulation, have been resorted to so long and so regularly that the whole business functions like a drug addict, which is to say it doesn't function at all except under artificial stimulation. And the manufacturers, or many of them, pander to this craving for stimulants, profit by the unnatural appetite, and thereby aggravate a condition which all know to be bad and which most of us realize is rapidly getting worse.

THE RATIONAL CURE

The cure for this condition lies with the trade itself. The trade must choose between stimulants and strength. So long as central stations, jobbers and retailers demand them, the manufacturers will contrive schemes and campaigns and tricks to get sales. Just as soon as the trade indicates that it desires to build up its real business strength and virility, then there will be manufacturers who will respond with the kind of co-operation such reconstruction demands.

Of course some manufacturers are trying to do this anyway, but it is a thankless job for the most part. Hard work was never popular, and the conservative, constructive manufacturer's program entails hard work upon the part of distributors, who just now seem to prefer the glowing poppy dreams of the vendor of stimulation—the easy sales, and profits handed over on a silver salver, without mental, physical or financial effort.

But the change will come, and soon. The electrical appliance business has too much momentum to be stopped, too much strength to be wrecked, too much investment to jeopardize and too many keen brains to long remain ignorant of the obvious trend. The change from temporary sales stimulants to permanent merchandising strength is the next big change we face.

It will come, inevitably and soon, because the public is already forcing the change. The public, in the last analysis, is both victim and judge of our selling methods.

ART, NOT IMPORTUNITY

Many present methods are distasteful. Women are exasperated at the constant stream of solicitors at the door. They are resentful of the cheap broadsides and handbills which clutter their mails. They are getting wise to tricky phrases that imply one thing and mean another. They are wholly sour on sketchy, ignorant and careless salesmanship, and they fear and repel bulldozing insistence. They want, and they will soon demand, the opportunity to buy electrical appliances as they buy other household equipment—upon a basis of information and selection.

This means that the electrical trade must soon abandon high-pressure schemes based upon low-grade man-power and rebuild its business structure upon the foundation of sound merchandising. It means that informative salesmanship must take the place of frenzied solicitation. (May I insert here, parenthetically, that Webster defines salesmanship as "the *art* of the salesman," and the word solicitation as "importunity.")

Finally it means that the manufacturers will be relieved of the necessity of providing extravagant sales stimulants which weaken and demoralize the trade. They will be permitted to center upon their real function of producing better and cheaper appliances.

Freight Containers Should Be Metal Strapped

Huge Losses from Bad Packing Shown in Railway and Government Investigations

AS IN every period of slackened business many electrical manufacturers and jobbers are rigidly scrutinizing all items of expense right now and introducing every possible economy in operating costs as a sensible step to offset reduced profits on decreased sales. There is no better field for large shippers of manufactured products to delve into at such a time than to investigate the scandalous waste and loss constantly taking place along the lines of transportation through the use of poor or improper containers. According to a recent study of less than carload freight made by the Freight Container Bureau of the American Railway Association within a period of one year 40,000,000 containers had to be repaired in transit. At twelve Western cities 43,000 containers required recoopering during the month of January, 1924, alone before they could even be started on their journey, and 6,700 containers were in such poor condition that they had to be rejected for transportation, entailing a loss in labor, materials and cartage running into big figures—and all avoidable.

Faulty packing and poor containers are costing the railways no less than $11,500,000 a year. This fact has been established by a critical inspection at destination of several hundred cars of miscellaneous merchandise. The Forest Products Laboratory of the United States Government estimates the economic loss to industry from the use of unsuitable and unscientifically designed containers at $500,000 a day.

The transportation companies, with the co-operation of the United States Department of Commerce, are making a special effort to bring to the attention of shippers and receivers one of the things that can be done to stop some of this needless waste; that is, the metal strapping of packages. The advantages of this form of package reinforcement are fully explained in circulars issued by the committee on freight claims of the American Railway Association, 431 South Dearborn Street, Chicago. Investigations made by this association show that reduction of claim payments during the last two years is largely due to the increased use of box strapping and the study of scientific container design by shippers and manufacturers of wood and fiber boxes. That box strapping is responsible for decreased damage and pilferage is confirmed by conferences with several hundred shippers whose damage and theft claims have been greatly reduced.

A chart covering the correct nailing of wood boxes and containing tables giving the right size nail to use and the correct number may be obtained from the National Association of Box Manufacturers, 844 Rudd Street, Chicago. Several hundred tests made by the government at its Forest Products Laboratory prove that proper nailing is a factor of vital importance in container efficiency, also that cement-coated nails, which cost on an average 10 per cent less than uncoated nails, have a much greater holding power.

Business Conditions

A Survey of Important Developments in the Electrical Market Including Data on Production, the Sales Outlook, Credits, Exports, the Metals and Other Conditions Affecting Cost, Supply and Demand

THE electrical business has shown distinct signs of improvement and the feeling is strong that the bottom has been reached and the market is moving up. More good-sized inquiries have been in evidence and there has been an increase in orders. Building continues in considerable volume and the demand for electrical construction material is active.

Central station buying has been rather slow due to postponement of deliveries. However, the fact that electric light and power financing for the first six months of the year reached a total of $457,507,200, as compared with $397,051,600 for the same period last year, indicates the tremendous volume of money that is to be spent in utility expansion programs, and gives a key to the general confidence of the electrical industry despite the fact that the General Electric Company's sales for the first six months of this year, for instance, are reported as 12 per cent less than last year for the same period. Increased orders from the steel industry also bring a good note to the market.

Appliance sales are running well in New England and the reopening of a number of textile plants has improved the tone of general business. In the New York district inquiries have been increasing from public utilities and business continues moderate with an even demand for supply lines. Sales of line and construction materials are reported very satisfactory in the Southeast, with considerable activity in electrical refrigerators. Central stations are purchasing much construction material in the Middle West and jobbers report a general stimulation of business with good sales of conduit and industrial heating apparatus. Industrial buying on the Pacific Coast is below normal. Building materials are moving well, however, with good sales of line construction materials in the Northwest.

General Construction Activity Declining Slowly

IN VIEW of the declining tendency in construction activity and in general business, June building operations held up at a remarkably high rate, according to the F. W. Dodge Corporation. Contracts awarded in June in 36 Eastern states (including about seven-eighths of the United States total of construction volume) amounted to $387,521,100. The decline from May was a little less than 8 per cent, and there was an increase of nearly 5 per cent over June of last year.

Construction started in these 36 states during the first half of this year shows a 10 per cent increase over the same period last year. However, the increase has not been general throughout the country. For instance, New York City has registered an increase of 83 per cent, while the territory outside of New York has shown a general decline of 1 per cent. The New York and Southeastern districts have shown substantial increases; New England increase has been moderate; the Middle Atlantic States have just equaled last year's record, and the Pittsburgh, Central Western and Northwestern districts have shown substantial declines. All the important classes of construction except industrial plants have participated in the increase in construction volume. Industrial construction has declined considerably, being a little

under 8 per cent of the total construction.

Since the building peak was passed a number of deferred projects have come into the market, which has held the volume of new contracts up to high level. The amount of deferred work, however, is now considerably less than it has been for some time. It seems scarcely probable that there is enough of it to bring about any considerable revival before the end of the year, such as occurred in the latter months of 1923.

Demand for Steam Superheaters Reduced—Deliveries Prompt

THE demand for steam superheaters, which is approximately the same as that for boilers and steam turbines, has been somewhat lessened within the last few months. This is due chiefly to the reduction of central station buying and the reduced activity of industrial firms, which are purchasing only for necessary replacements.

Superheaters are being used to-day to a much greater extent than formerly. Of all the boiler-heating surface now installed for power purposes, approximately 75 per cent is equipped with superheaters, as against 20 per cent about fifteen years ago. This is due largely to the fact that the greater part of the boiler equipment sold is for use in central stations and also to the fact that industrials are using superheaters to a much greater extent.

Deliveries are very prompt as the necessary special quality and gage of seamless steel tubing is readily obtainable. Prices are stationary and no changes are anticipated, for although labor costs are upward, steel prices are downward and both movements have been slight. However, there is some price cutting in the effort to obtain business.

Synchronous Motor-Driven Clocks in Increasing Demand

SALES of motor-driven clock mounts for instrument makers continue high with little change in volume. The business transacted during the first half of 1924 is about 110 per cent higher than for the same period last year. Buyers of secondary clocks for time service on systems where the frequency is controlled by a master clock include industrial plants, educational establishments and institutions in substantially equal quotas. Central-station purchases are improving and interest in small synchronous clocks for residential use is gaining.

Within a month one order for more than a hundred secondary clocks of the synchronous type and a master clock has been placed by the government of Uruguay. Service will be supplied by the Montevideo central station, and local installations will be made on street posts and in public buildings. Australia, the Dutch East Indies and Hawaii have been buying synchronous clocks and the Ontario Hydro-Electric Commission has purchased clocks for use in the Niagara stations. The Brooklyn Edison Company has also bought sixty clocks within three months, including a program clock for laboratory testing. Motor-driven clocks with sweep-second hands have also been developed for use in operating rooms and wards and are in use at the Hartford (Conn.) hospital. Another active field is that of the synchronous tower clock. Equipment of this type has been recently delivered to the Minneapolis (Minn.) City Hall, with thirty secondary clocks, all to be run by central-station service. A tower clock of the same type, with secondaries, is also being installed in the Minneapolis station of the Chicago, Milwaukee & St. Paul Railroad.

The outlook is most promising for all applications of synchronous clock apparatus. Within the past year price reductions have been made as a result of the increasing volume of business.

More Activity in Metal Market—Prices Move Slightly Higher

WITH more inquiries being received for non-ferrous metals during the week there is a more optimistic feeling among the producers.

Consumers report that the demand for finished goods is improving in many lines. Slight increases in prices of all metals have been made and there is less desire to shade quotations to obtain business. The demand for copper has been much better and the volume of business has been larger than for some weeks. Some large corporations which use extreme care in their buying have been in the market and a particularly good order was placed on Tuesday. Although no statistics are available there is indication of a reduced production of copper.

NEW YORK METAL MARKET PRICES

	July 9, 1924 Cents per Pound	July 16, 1924 Cents per Pound
Copper, electrolytic	12¼	12¼–12⅜
Lead, Am. S. & R. price	7.00	7.00
Antimony	8.35	8.25–8.30
Nickel, ingot	27	27
Zinc, spot	6.15	6.15
Tin, Straits	43¼	46.25
Aluminum, 98 to 99 per cent	27½	27

The price of lead remains at 7 cents and is so generally quoted. The demand has not been as active as in the spring, but it is improved, and producers have no fear of the immediate future.

Zinc is again in demand by the galvanizers, but most of the orders went to one producer who did an exceptionally large business. Prices are showing an improvement.

Tin again moved up in price due to manipulation on the London market. While purchasing has improved buyers are still showing little interest in the market.

New England Electrical Trade in Steady Volume

SALES of electrical material in New England continue in even volume in most districts, the demand being not far from normal for the season. Retail business is better and there is a very fair demand for the less bulky electrical appliances. Irons are moving regularly in heavy volume and lamp sales in units are running well above last year. Bids were submitted this week for about 1,100 lighting fixtures to be installed in a department store customers' garage at Boston, and considerable industrial plant betterment work is under way, reflected in jobbers' sales and wiring contracts.

Dealers are still "cashing in" upon the electric range show held in Boston last spring, one reporting sales of a dozen to fifteen per week. Portable lamps are moving well and the sale of kitchen units is still an important feature of the central station market. Syndicate company sales of electrical appliances ran above last year's figures in the last reported week's activities of one large organization.

More confidence is being expressed by the industry, and the resumption of operations by a number of textile manufacturing plants has improved the tone of business in some localities that have been depressed.

Business in the New York District Is Holding Up Well

THE improvement in business noticed in the New York district at the beginning of July is continuing and from present indications the volume of sales for this month will be better than June. Motors are moving slowly but other apparatus is active. More inquiries for delayed maintenance material are being received from public utilities and requests for material for a new construction job are also in the market. Other new work is reported in contemplation in northern New York which will embrace pole line material and outdoor substations. Sales of apparatus have also shown a marked improvement in this territory.

Jobbers report an even demand for supplies with no marked movements. Building materials are selling in good volume and competition is keen. Fan business is only moderate due to cool weather. Radio sales are very low but manufacturers are all busy building up stocks in anticipation of a good fall trade.

Trade in Middle West Showing Improvement

THE demand for construction materials by central stations in the Middle West has revived considerably. The heaviest demand noted was for indicating and watt-hour meters. High-tension equipment demand appears active, one manufacturer having received a sizable order for a 33,000-volt outdoor substation and another a substantial order for disconnecting switches. Pole-line hardware remains about the same, with some additional business being received. Manufacturers generally report a fair amount of business.

Jobbers are of the opinion that business has been stimulated. The number of inquiries requesting quotations have increased and certain items previously inactive have moved better this week. This is particularly true of conduit. One distributor states that about eight carloads of conduit have been sold this week, which represents a fair volume of business. Industrial heating sales have been good, particularly in hotel and restaurant equipment. Sales of ven-

tilating fans have increased, although the small fan business is still off, due to unfavorable weather conditions. A substantial volume of business has been obtained from the sale of kitchen units. The lighting campaign, started by the retail merchants some time ago, continues to increase sales of better lighting equipment. Building activities seem to be falling off. Building permits issued this week were 33⅓ per cent less in number and $2,000,000 less in value than for the same week last year.

Construction Materials Moving in Good Volume in Southeast

EXCELLENT weather conditions and the large building program now under way are reflected in good business reported by practically all jobbers in the Southeast. Central station purchases of line and construction materials are considered satisfactory and many orders for similar materials from municipally owned and small privately owned systems are in excess of the usual seasonal volume. Poles, are moving satisfactorily, particularly those of the creosoted pine variety.

Mild weather during the past few weeks has somewhat slowed up the movement of fans, but has stimulated radio sales. Shipments of new models of radio apparatus are being received by the jobbers and good stocks are expected to be on hand for the increased fall trade. The intensive sales effort of two leading manufacturers are doing much to stimulate interest in electric refrigerating equipment and sales of the commercial and domestic types are increasing steadily.

Line Construction Materials Moving Well on Pacific Coast

THROUGHOUT the Pacific Coast electrical building materials are moving well and sales of transmission and construction materials to central stations are particularly active in the Northwest. Building construction, both of the business and residential type, is continuing with no visible signs of abatement. No especially large orders have been placed, one for seventy flood-lighting projectors for the new Pacific Gas & Electric Company's building at San Francisco as well as equipment for several rural telephone lines being among the most important.

Lumber mills are not purchasing in the volume expected during the mid-summer shutdown when repairs and replacements are usually made. In fact, sales to all industrials are below normal for this season. Prices are fairly steady with an upward tendency, motors having been increased slightly. Electrical exports from California have improved to the extent of several assorted orders for Mexican and Central American plants. San Francisco is making a strong bid for export business by the construction of a manipulating warehouse wherein imported goods may be cleaned, repacked and reshipped without payment of additional customs duties.

Credit conditions are good. Collections have slowed very slightly and through efficient handling are still running under fifty days.

Activities of the Trade

Devoted to News of the
Manufacturer, Jobber, Agent, Contractor and Dealer, Including Important Orders and Contracts for Apparatus and Equipment

Stone & Webster to Build Plant Near Wilkes-Barre

Stone & Webster, Inc., 147 Milk Street, Boston, Mass., has been retained to design and construct a steam-electric power station for the Luzerne County Gas & Electric Corporation, with headquarters at Kingston, Pa., across the Susquehanna River from Wilkes-Barre. This plant is to be located on the Susquehanna River near West Nanticoke and its initial development will consist of one 20,000-kw. turbo-generator and four 1,726-hp. boilers.

General Electric Tipless Lamp Patents Sustained by Court

The White & Mitchell patents covering the modern tipless lamp and its manufacture have been sustained by Judge Garvin in the United States District Court, Eastern District of New York in a suit brought by the General Electric Company against the Save Electric Corporation. The court in handing down its decision said that the lamps made by the defendant are substantially like the plaintiff's and the machines used in their manufacture are the same to all practical intents and purposes and that therefore "To permit the appropriation of valuable advances in such a manner would be to take away all incentive to those engaged in inventive activity." In the court's opinion the plaintiff has a novel and valuable invention in its lamp, process and machine, which the defendant has infringed and a decree was given for injunction and accounting.

Curtis Lighting Introduces New Show Window Reflector

Curtis Lighting, Inc., formerly National X-Ray Reflector Company, 1119 West Jackson Boulevard, Chicago, announces the manufacture of two new and powerful X-ray reflectors, designed especially for show-window lighting and using 500-watt lamps. The new reflectors are designated as No. 900 X-Ray Giant and No. 910 X-Ray Leviathan. Each is equipped with a special holder and Mogul socket. The new units list at $15 each, complete including fittings, and are now ready for delivery.

General Electric Company Reports Decrease in Orders

Orders received by the General Electric Company for the six months ended June 30 totaled $144,707,887, Gerard Swope, president, recently announced. This is a decrease of 12 per cent compared with the corresponding period in 1923, when orders totaled $164,263,755. Orders for April, May and June, 1924, amounted to $71,219,984, a decrease of 15 per cent compared with the same three months of the year 1923.

Transmission Tower Fabricating Company a New Chicago Firm

The Transmission Tower Fabricating Company was recently organized in Chicago to design, build and sell fabricated and plain steel towers and steel structures for substations. It is capitalized at $2,000 as a closed corporation and its officers are: George H. Truman, president and general manager, and Milton Greenberger, secretary-treasurer.

The company is now in production, having a plant located at Joliet, Ill., capable of producing 100 tons of steel per day. The galvanizing is handled at Joliet and Batavia. The Joliet plant is equipped with the latest type of multiple-punching machinery. The executive offices are located at 1652 Monadnock Block, Chicago. Sales representatives have been appointed throughout many of the large Middle West cities and appointments are now being made for the Eastern cities.

Page & Hill Purchase Metropolitan Cedar Company

The Page & Hill Company of Minneapolis has recently purchased the Metropolitan Cedar Company at Spokane, Wash. The stocks of the Metropolitan Cedar Company, added to the Western red cedar resources of the company, will materially increase its facilities for rendering service to customers.

The Page & Hill Western office, formerly located at Newport, Wash., is now in the Peyton Building, Spokane, Wash. J. E. Seaman, long connected with the pole industry, has joined the Page & Hill organization as manager of Western operations, with headquarters at Spokane.

Westinghouse Moving Turbine Blading Department

The entire turbine blading department of the Westinghouse Electric & Manufacturing Company, now at the main works at East Pittsburgh, Pa., is being moved to the South Philadelphia works of the company at Lester, Pa. It is planned to have the new plant in operation by October 1. Two buildings are being erected at the South Philadelphia works, of steel and hollow tile, to house the department. One of these buildings is a single-story structure, 500 ft. x 145 ft. The other building,

two stories high, which adjoins the first, is 320 ft. x 180 ft. About 100 employees, for the most part foremen and supervisors. will be moved from the East Pittsburgh works to Lester.

This move is being made so that the entire turbine assembly will be in one plant to facilitate production of large turbine machines of capacities ranging from 20,000 kw. and larger, of which thirty-five are now on order to be built at the South Philadelphia works. Part of the machinery has already been shipped and the men to be changed will be moved as needed.

Electrical Development & Machine Occupies New Building

The Electrical Development & Machine Company, Philadelphia, manufacturer of the "Franklin" line of power equipment and appliances, is now occupying its new factory building at Holmesburg Junction, Philadelphia. The new plant covers 6 acres and is advantageously located on the main line of the Pennsylvania Railroad from New York to Philadelphia.

The factory building, constructed of steel, concrete and brick, provides greatly increased floor space and with modern equipment and production methods the company is fully equipped to handle its increasing volume of business.

General Electric Gets Large Order For Substation Equipment

What is declared to be the largest order of automatic substation equipment ever placed in the United States has just been contracted for by the Department of Street Railways, city of Detroit, with the General Electric Company. The order calls for a total of ten 2,000-kw. and four 1,000-kw. synchronous converters, aggregating 24,000 kw. Both semi-outdoor and indoor type substations are to be used, but all of the transformers will be of the outdoor type. All of the substations will operate for the present from a 24,000-volt, three-phase, 60-cycle supply.

The order includes high-reactance type oil-cooled, single-phase transformers with 24,000-volt primary automatic switching equipment, outdoor type oxide film lightning arresters, oil circuit breakers for the incoming lines and high-speed circuit breakers for the protection of each station. The stations will be fully automatic, including reclosing feeders.

A contract was also recently closed for complete electrical equipment of a new cement mill at Coreen, Ga. The order consists of two 1,000-kw. turbogenerators, a sixteen-panel switchboard, over sixty induction motors of various sizes and six synchronous motors, four rated 500 hp. and two 300 hp. It is expected that the entire plant will operate at or very near unity power-factor at all times.

The Antigo Electric Sign Manufacturing Company, Antigo, Wis., will establish a plant at Dorr and Fourth Streets for the production of outdoor electric signs. N. E. Fowler is general manager.

Westinghouse Meeting at Newark

Central station division managers and meter specialists of the Westinghouse Electric & Manufacturing Company from all parts of the country spent three days at the Newark works last week. More than seventy-five men were present at this meeting, which was the first of its kind held in fourteen years. On Tuesday leading meter engineers at the works and executives from East Pittsburgh addressed the gathering. On Wednesday the factory was visited and every detail of meter manufacture observed closely. On Thursday instruments and relays were considered.

A feature of the meeting on Wednesday night was a banquet at the Newark Athletic Club. At this meeting, which was presided over by T. J. Pace, manager of the supply department, H. D. Shute, A. A. Brown, John J. Gibson, J. F. Tritle and other executives gave enthusiastic talks about the prospects for an increasing business.

The executives and engineers at the Newark works had arranged an unusually attractive program and all those in attendance gained in knowledge and spirit.

The Rollway Bearing Company, Inc., Syracuse, N. Y., manufacturer of radial and thrust roller bearings, announces that Fred I. Clapp, formerly connected with its engineering department, has recently been appointed representative of the company in the Chicago district.

The Everhot Electric & Manufacturing Company, with offices at 615 Van Nuys Building, Los Angeles, Cal., has been recently organized by John M. Morris and associates. The new concern is capitalized at $50,000 and plans to manufacture electric water heaters. The business of the Pacific Electric & Manufacturing Company, manufacturer of electric water heaters and thermostats, has been absorbed by the new company.

Jackson & Moreland, consulting engineers, have moved their offices from 387 Washington Street to 31 St. James Avenue, Boston.

The Fansteel Products Company, Inc., North Chicago, Ill., announces that sales of its standard "Balkite Charger," a 3-amp. direct-current charger to operate on 60 cycles, alternating current, which was put on the market last year, have reached the 30,000 mark. Production plans have been made for the manufacture of a minimum of 100,000 for the coming season.

The Russell Electric Company, Chicago, manufacturer of electrical appliances, announces the manufacture of two new curling irons. One iron, known as Catalog No. 3, has a $\frac{7}{16}$ in. diameter rod and is $5\frac{1}{4}$ in. long; the other, known as No. 5, has a $\frac{3}{8}$ in. rod and is $6\frac{1}{4}$ in. long. These irons are listed at $3.75 each. Both devices have a separable plug in the handle.

The Saylor Electric & Manufacturing Company, manufacturer of "Saylorduct" flexible conduit, announces its removal from Wheeling, W. Va., to Detroit, where a new manufacturing plant has been purchased.

The Refrigerating Development Corporation is in process of organization by M. F. Jurick, 14 North Tenth Street, Allentown, Pa. The new concern will have a capital of $100,000 and will manufacture electrical refrigerating machinery. Negotiations are under way for the purchase of an assembling plant.

The Scofield-Hendricks Company has been recently incorporated under Connecticut laws at Hartford, Conn., to manufacture, lease and deal in electrical machinery and devices. The new firm is incorporated at $50,000, and the incorporators are: George H. Scofield, Raymond Hendricks and K. F. Hendricks, all of 61 Allyn Street, Hartford.

The Texas Creosoting Company, Orange, Tex., producer of creosoted piles, poles, cross-arms, etc., announces that it started operations in March and is now running full time. The plant has a large capacity and the company states that it is able to undertake orders of any size. A monogrammed copper dating nail is used as a means of identifying its product.

The Western Electric Company, has arranged for the construction of a three-story factory branch and distributing works at Valley and Minor Streets, Seattle, estimated to cost approximately $150,000. The structure will be owned by the Pacific Telephone & Telegraph Company.

The Triumph Electric Company, Cincinnati, Ohio, manufacturers of motors, announces that S. E. Church, formerly of the S. E. Church Electric Company of Chicago, has been appointed district manager of the Chicago office, to succeed W. R. Bonham, who resigned on July 1. Mr. Bonham will hereafter devote his time to his farm interests in the South.

The Serrell Electric Appliance Corporation of Delaware has recently been incorporated to engage in the manufacture and sale of electric ranges. G. A. Earl is president and the New York office of the company is located at 2 Rector Street. Capital is stated at 20,000 shares preferred stock, $50 par value, and 100,000 shares of common stock, no par value.

The Doherty Stove Company, Sarnia, Ont., Canada, manufacturer of electrical water-heating equipment, stoves, etc., has plans under way for the construction of a new plant at Sarnia, estimated to cost $150,000.

The Reynolds Electric Company, Chicago, manufacturer of fractional horsepower motors and motor-driven appliances, announces the development of a complete new line of color hoods—ruby, green, blue, amber, opal and canary—in the P-19 size, which fits the new P-19 bulbs in the 25-watt and 50-watt sizes of mill type lamps, which are now being marketed for sign work by the lamp companies. The "Cliquot Club" sign recently installed on Broadway, New York City, uses over 3,000 of the P-19 hoods.

The Strom Ball Bearing Manufacturing Company, Chicago, announces the opening of a new distributing station at 2322 South Michigan Avenue, Chicago. A complete stock of Strom ball bearings will be carried.

New Trade Literature

TURBO-GENERATOR UNITS. — The Ridgway Dynamo & Engine Company, Ridgway, Pa., is distributing bulletin No. 31, which describes and illustrates the "Ridgway" turbo-generator units, made in capacities from 300 kw. to 5,000 kw. Considerable space is devoted to its turbine governor.

INSTRUCTIONS FOR ELECTRIC PYROMETERS.—The Superheater Company, 17 East Forty-second Street, New York City, has issued a second edition of its instruction book covering the installation and maintenance of model 496 superheated steam pyrometers. It also gives instructions relating to marine and stationary industrial plants. A pyrometer test set is described, and instructions for inspection of the pyrometer and tests of various parts with and without the test sets are given.

STEAM RAILROAD ELECTRIFICATION.—Several new publications have been issued by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., on steam railroad electrification as follows: Reprint No. 176, entitled "Baldwin-Westinghouse Electric Locomotives," covers the Baldwin-Westinghouse electric locomotives for trunk line service. Folder No. 4,596, entitled "An exhibit of Modern Steam and Electric Equipment," gives information relating to the most important units of motive power exhibited at the midwinter convention of the American Institute of Electrical Engineers. Folder No. 4,587, "Suburban Transportation by Electricity," gives a summary of the equipment, distribution system and operating data of the Philadelphia-Paoli electrification of the Pennsylvania Railroad. Leaflet No. 20,153 describes the company's type "K-35" controller. Leaflets Nos. 20,055-A and 20,148 cover its 535-A and 514-A railway motors respectively. "Freight Haulage" is the title of leaflet No. 20,174, which shows the benefits derived from the establishment of freight service on interurban lines. Leaflet No. 20,154, "External Fans for Non-Ventilated Railway Motors," gives illustrations of motors arranged for ventilation with the external fan.

INSTRUMENT TRANSFORMERS.—Bulletin No. 65 issued by the Sangamo Electric Company, Springfield, describes and illustrates the various types of the Sangamo instrument transformers.

DIESEL ENGINES. — The Fulton Iron Works Company, St. Louis, Mo., is distributing bulletin No. 806, which contains illustration of various installations of the Fulton-Diesel engines in industrial plants.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

Purchase is desired in Maracaibo, Venezuela (No. 10,874), of a one-battery charging plant.

An agency is desired in Havana, Cuba (No. 10,886), for electrical supplies.

Purchase and agency are desired in Florence, Italy (No. 10,877), for electrical supplies, principally insulators, insulating materials, wires of special alloys and metals of all kinds.

An agency is desired in Antwerp, Belgium (No. 10,875), for electric floor-waxing machines. Purchase and agency are also desired for electrical household articles and novelties.

Purchase and agency are desired in Jaffa, Palestine (No. 10,862), for electric motors, 1 to 10 hp., and for pumps, including electrically driven pumps.

Purchase and agency are desired in Malaga, Spain (No. 10,878), for radio sets and parts.

An agency is desired in Valencia, Spain (No. 10,879), for radio sets and parts.

An agency is desired in Berlin, Germany (No. 10,876), for radio sets, one to three tube, and parts.

Purchase is desired in Glasgow, Scotland (No. 10,849), for radio supplies.

An agency is desired in Vancouver, Canada (No. 10,880), for electrical refrigerators for home use.

An agency is desired in Alexandria, Egypt (No. 10,820), for Diesel engines; (No. 10,859), for Diesel engines and semi-Diesel engines.

An agency is desired in Vienna, Austria (No. 10,888), for electrolyte copper, in wire, bars and plates.

Purchase is desired in Chihuahua, Mexico (No. 10,917), for storage battery parts and molds for lead cups, screws, cell connectors, etc.

An agency is desired in Vancouver, Canada (No. 10,916), for electrical appliances.

An agency is desired in Santo Domingo, Dominican Republic (No. 10,915), for electrical supplies.

An agency is desired in Bombay, India (No. 10,946), for electrical supplies.

An agency is desired in Johannesburg, South Africa (No. 10,913), for electrical tools and lighting systems and radio equipment.

Purchase and agency are desired in Malaga, Spain (No. 10,919), for magnetos, for radio receiving sets and parts and for wiring supplies and fixtures. (No. 10,918), for radio sets and parts, both sending and receiving.

TRANSFORMERS FOR HANKOW, CHINA, ELECTRIC PLANT. — Bids are being asked by the Hankow (China) Water Works & Electric Light Company to be opened Sept. 30, for nine 1,000-kva. transformers for 2,300/6,000 volts and for six 210-kva. transformers for 2,300/460 volts.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

BOSTON, MASS.—The Edison Electric Illuminating Company has taken out a permit to construct an equipment storage and distributing works at 1135 Massachusetts Avenue, to cost about $160,000.

PAWTUCKET, R. I. — The Blackstone Valley Gas & Electric Company is arranging an appropriation of about $500,000, to be used for extensions and improvements in its system during the next twelve months.

PROVIDENCE, R. I.—The Narragansett Electric Light Company has filed plans for extensions and improvements to its substation on Admiral Street.

EAST HAMPTON, CONN.—Extensions are contemplated by the Central Connecticut Power & Light Company, including the erection of a transmission line from East Hampton to Glastonbury, a distance of 16 miles, and a branch line to Marlboro, 5 miles long. A three-phase substation will be erected in Glastonbury.

NORWICH, CONN.—Bids will be received at the office of the City of Norwich Gas and Electrical Department until July 22 for the installation of an ornamental lighting system.

Middle Atlantic States

AKRON, N. Y.—The General Crushed Stone Company, Easton, Pa., contemplates the installation of electric power equipment in connection with the proposed rebuilding of its local mill, recently destroyed by fire with loss of about $200,000.

BINGHAMTON, N. Y.—The Board of Contract and Supply is planning to build a power house at the city hospital, in connection with an addition at the institution. The entire cost is estimated at $1,000,000. Walter Whitlock, Security Building, is steam and electrical engineer.

BROOKLYN, N. Y.—Plans have been filed for building an addition to the power plant at the Brooklyn Hospital, De Kalb Avenue and Raymond Street, to cost about $27,000.

BUFFALO, N. Y.—The Board of County Supervisors has authorized that bids be asked for a heating and lighting plant for the new county penitentiary and home at Alden, to cost about $229,000.

BUFFALO, N. Y.—Bids will be received by the Department of Parks and Buildings, City and County Building, Buffalo, until July 22 for furnishing ash-handling equipment and making alterations to the power house at the J. N. Adam Memorial Hospital, Perrysburg.

ITHACA, N. Y.—The Public Service Commission has granted the New York State Gas & Electric Corporation permission to extend its transmission lines to serve electricity in the towns of Westford and Cherry Valley.

KENWOOD, N. Y.—Application has been made to the Public Service Commission by Martin W. Keller, owner of the Kenwood Electric Company, for approval of franchise granted to him by the town of Vernon and the city of Sherrill to supply electric service in those places.

MOUNT MORRIS, N. Y.—The transmission line which supplies electricity to the Retsof salt mines from Niagara, it is reported, will soon be extended so that Mount Morris and Geneseo will receive energy from the Niagara system. The proposed new line will pass through Cuylerville, where it will connect with an extension from Perry, linking the New York Central Electric Company with the Niagara system and the Mount Morris plants. Nunda, Portageville, Fillmore, Belfast and Caneadea will be units in the interlocking system. The line will supplement the current generated at Mount Morris and in the future will probably be called upon to supply power that will be required in the construction of the dam at Mount Morris.

NEW YORK, N. Y.—The Department of Plant and Structures, Municipal Building, plans to install electric power equipment at the proposed municipal terminal market to be erected on the site of the present Gansvoort Market, for which an appropriation of $10,000,000, has been approved. An ice and refrigerating plant will also be installed.

ORWELL, N. Y.—The Niagara, Lockport & Ontario Power Company is negotiating for the purchase of a site on the Salmon River, near Orwell, for a proposed hydro-electric power development.

POTSDAM, N. Y. — The St. Lawrence Valley Power Corporation has been granted permission to take over and merge the Hannawa Falls (N. Y.) Water Power Company. Extensions are planned, including hydro-electric power development.

WATERTOWN, N. Y.—The St. Regis Paper Company has issued $1,500,000 in bonds in the name of the St. Regis Paper Company of Canada, Ltd., part of the proceeds to be used for extensions, including hydroelectric development.

CHESTER, PA. — The City Council is reported to be planning the installation of electrically operated pumping equipment in connection with a proposed sewage disposal plant, to cost about $2,500,000, for which plans have been authorized by the State Health Department.

CONSHOHOCKEN, PA.—The Board of Commissioners, Plymouth and Whitemarsh Townships, are considering the installation of an improved street-lighting system on the Butler Pike, under a joint agreement for cost and maintenance.

FRANKLIN, PA.—Arrangements, it is reported, are being made by the Cambria Steel Works for the construction of a new electric plant at Franklin.

MONTROSE, PA.—Arrangements have been made by the Susquehanna County Light & Power Company to extend its 16,200-volt transmission line to South Montrose, a distance of 2½ miles. The company has purchased the franchise of the South Montrose Light & Power Company.

NEW CASTLE, PA.—The Carnegie Steel Company will make extensions to the power plant at its local mills, in connection with extensions and improvements to its works, for which an appropriation of $1,000,000, has been made.

SLIPPERY ROCK, PA.—Plans are under way to replace the gas lamps now in use with electric lamps. Electricity will be supplied by the West Penn Power Company, which is extending its transmission line from a point near Branchtown, a distance of about 4 miles.

UNIONTOWN, PA.—The installation of an ornamental lighting system on Main, Fayette, Morgantown Streets and Gallatin Avenue is under consideration by the City Council. Street lighting service is furnished by the West Penn Power Company.

WARREN, PA.—The Borough Council is considering the installation of a new street lighting system on Park Street.

WILMINGTON, DEL.—The Fourth Street Improvement Association is negotiating with the City Council for extensions and improvements in the street-lighting system on Fourth Street from the Wilson Line to Halley Street.

ANNAPOLIS, MD.—The Annapolis & Chesapeake Bay Power Company has applied to the Public Service Commission for permission to purchase the distributing systems at West Annapolis and Wardour.

BALTIMORE, MD. — The Consolidated Gas, Electric Light & Power Company has secured permission to erect a transmission line to the plant of the Congoleum Company, near Finksburg.

WASHINGTON, D. C.—Bids will be received by the Emergency Fleet Corporation, United States Shipping Board, Navy Building, until July 21, for 130,000 metal condenser tubes.

North Central States

DETROIT, MICH.—Plans are being prepared by the Ford Motor Company for the construction of a power plant at its proposed manufacturing and assembling works at Dagenham England The entire cost is estimated at $3,000,000.

DETROIT, MICH.—Electric power equipment will be installed in the proposed printing plant of the "Detroit Free Press," to be erected on West Lafayette Street near Cass Avenue, at a cost of about $2,700,000. Albert Kahn, Marquette Building, is architect.

GARDEN, MICH.—Plans are under way for the installation of a local light and power system. It is proposed to build a transmission line to obtain electricity to operate the system.

IRON MOUNTAIN, MICH.—The Ford Motor Company, Detroit, plans to install electric power equipment at its proposed local saw and lumber mill, to cost about $300,000.

JACKSON, MICH. — The Consumers' Power Company is said to be planning to build a 21,300-hp. hydro-electric power plant at the county line on the Manistee River.

LANSING, MICH.—The Municipal Electric Light and Water Department has awarded a general contract to the Reiniger Construction Company for the erection of an electrical and mechanical repair and equipment distributing works, to cost about $115,000, with machinery.

PECK, MICH.—The Great Lakes Power Company, Caro, has been granted a franchise in Peck and will take over the municipal electric distribution system. Extensions and improvements to the system are contemplated.

MINSTER, OHIO.—A special election will be held July 29 to vote on the proposal to issue $30,000 in bonds, the proceeds to be used for enlarging the municipal electric light plant.

OAK HARBOR, OHIO.—The Council has appropriated $12,000 for extensions to the municipal light and water system this year.

TOLEDO, OHIO.—The Ideal Laundry Company contemplates the construction of a power house at its local plant, to cost about $50,000. S. M. Jokel, Nicholas Building, is engineer.

INDIANAPOLIS, IND.—The Indianapolis Candy Company, 225-27 Maryland Street, it is reported, will take bids at once for the erection of a power plant at its proposed factory at Union and McCarty Streets, to cost about $100,000. A radial brick stack will be built. The Russell N. Edwards Company, Union Trust Building, is architect and engineer.

DE KALB, ILL. — The Illinois Power Company has applied to the Illinois Commerce Commission for permission to erect a transmission line from De Kalb to Malta to supply the village with electricity.

KEWANEE, ILL.—The Kewanee Public Service Company has authorized the sale of $1,200,000 in bonds, the proceeds to be used to acquire the properties of the Consolidated Light & Power Company in Kewanee, Neponset, Sheffield and Galva, and to take over the local municipal electric plant, and also the street railway and interurban systems.

FOND DU LAC, WIS.—The City Commission has approved the petition requesting the installation of an ornamental lighting system on Linden Street from Western Avenue to West Twelfth Street.

HANCOCK, WIS.—Arrangements have been made between the Wisconsin Power & Light Company and the White River Power Company, whereby the former will take over the electric franchise and electric lines in Hancock, and will supply electrical service here. Plans are under way to erect a transmission line from the two hydro-electric plants on the White River to Hancock. The Wisconsin company has agreed to purchase all surplus current generated at the stations of the White River Power Company. Eventually, it is expected that the transmission line will be extended north to Plainfield and south to Coloma.

POYNETTE, WIS.—The name of the Badger Electric Service Company has been changed to the Badger Light & Power Company. Steps have been taken to increase the capital stock from $35,000 to $50,000.

PAULINA, IOWA.—The Western Iowa Power Company has received a local franchise to furnish electricity in conjunction with the municipal power plant. The company proposes to make extensions to its transmission line in this section.

AVA, MO.—The power dam of the Ava Electric Light Company at Lake Crystal was recently washed out. As yet no definite plans have been made for rebuilding the dam.

MOUNTAIN GROVE, MO.—Bids, it is understood, will be asked about Aug. 1 for the construction of a municipal electric plant and distribution system, to cost about $125,000. The Alexander Engineering Company, Woodruff Building, Springfield, is engineer.

GRAND ISLAND, NEB.—The Central Power Company contemplates extensions and improvements this year calling for an expenditure of about $350,000.

OMAHA, NEB.—The Nebraska Power Company plans to build a substation at Thirty-seventh and P Streets, to cost about $28,000. John and Alan McDonald, Standard Oil Building, are architects.

SWEDEBURG, NEB.—The Council is planning to install an improved street-lighting system, to cost about $65,000.

PITTSBURG, KAN. — Bids will be received by the Board of Administration, Kansas State Teachers' College, until July 22, for the construction of a power house addition.

Southern States

PICKENS, S. C.—Contract has been awarded by the Commission of Public Works to J. E. Sirrine & Company, engineers, Greenville, to design a new lighting system and to erect a transmission line from Easley to Pickens.

DELRAY BEACH, FLA. — Extensions and improvements are contemplated for the municipal electric plant.

HAINES CITY, FLA. — Bonds to the amount of $65,000 have been issued, the proceeds to be used for extension to the water system and for the installation of an ornamental lighting system throughout the business section.

JACKSONVILLE, FLA.—The Board of County Commissioners are considering installing electric lamps on the Atlantic Boulevard from South Jacksonville to Neptune. The cost is estimated at about $25,000.

PALATKA, FLA.—Bonds to the amount of $15,000 have been voted for the installation of an ornamental lighting system.

SEBRING, FLA.—At an election to be held July 29 the proposal to issue $135,000 in bonds for extensions and improvements to the municipal light and water system will be submitted to the voters.

CHATTANOOGA, TENN.—The Tennessee Electric Power Company, it is reported, has acquired the properties of the Cumberland Power Company, Maryville (Tenn.) Lighting Company, Lenoir City Light & Power Company and the Madisonville (Tenn.) Light & Power Company, and the electric properties of the Long Manufacturing Company and the Tellico River Lumber Company. Extensions and improvements will be made in transmission system.

DECATUR, TENN.—The Decatur Light Company, recently organized, is reported to be planning to install a light and power system for local service. T. G. Davis is interested in the company.

SOMERVILLE, TENN. — The Council contemplates the rebuilding of the municipal light plant and waterworks station recently damaged by fire.

EUREKA SPRINGS, ARK.—The local electric light plant has been purchased by the Carroll County Utilities Company, Eureka Springs.

TUPELO, MISS.—The Mississippi Power Company, which recently acquired the local power station, plans to erect a transmission line from Tupelo to Verona, Shannon, Egypt and other towns.

CHICHASHA, OKLA.—Negotiations are under way by the Chichasha Gas & Electric Company for extending its Minco transmission line to Union City.

SHAWNEE, OKLA.—The Chicago, Rock Island & Pacific Railroad Company contemplates the installation of electric power equipment in connection with the proposed rebuilding of its local car and locomotive repair shops, recently damaged by fire, with loss of about $500,000.

WILBURTON, OKLA.—The Southwest Power Company has been granted a franchise to erect a 66,000-volt transmission line from its local substation over the streets of the city in order to reach the Lutie mining district to furnish power service there. The company, it is understood, contemplates extending the line eventually to Red Oak and Wister.

CROCKETT, TEX.—The Texas Power & Light Company, Dallas, has been granted a franchise to erect a high-tension transmission line through Houston County.

GAINESVILLE, TEX.—Steps have been taken by property owners on California Street and Court House Square for the installation of a new street-lighting system.

Pacific and Mountain States

ABERDEEN, WASH.—The Grays Harbor Railway & Light Company has applied for permission to use a power site on the Queets River, Jefferson County, for hydro-electric power development, to cost $1,000,000. A steel-tower transmission line will be built.

VANCOUVER, WASH.—The Northwestern Electric Company plans to construct a substation in Vancouver, to cost about $85,000.

GLENDALE, CAL.—The installation of a fire alarm system, to cost about $25,000, is under consideration.

HILMER, CAL.—Bids will be received by P. J. Thornton, county clerk, Merced, until July 28, for the installation of an improved lighting system in the Hilmar Lighting District.

LOS ANGELES, CAL.—The City Council has adopted an ordinance providing for the installation of an ornamental lighting system on Sunset Boulevard, the plans call for 342 pressed steel posts.

MANTECA, CAL.—The directors of the San Joaquin Irrigation District have authorized an issue of $430,000 in bonds, parts of the proceeds to be used for the installation of a series of pumping plants.

SANTA MONICA, CAL.—The City Commissioners are considering the installation of a municipal electric plant to supply electricity for street lighting and to operate the waterworks pumping station.

SANTA ROSA, CAL.—The Pacific Gas & Electric Company contemplates extensions and improvements to its local substation, involving an expenditure of about $98,000.

NAMPA, IDAHO.—The Pacific Fruit Express Company, San Francisco, contemplates the construction of a power house at its proposed local car repair shops, to cost about $400,000.

SALT LAKE CITY, UTAH.—The Utah Power & Light Company has applied to the State Utilities Commission for permission to enlarge its Jordan plant in Salt Lake City, increasing the output by 20,000 kw.

BURNS, WYO.—The town officials are considering erecting a 13,200-volt transmission line to Pine Bluffs to secure electricity from the plant of the Pine Bluffs Light & Power Company to operate the local system.

LITTLETON, COL. — Extensions and improvements are contemplated by the Arapahoe Electric Light & Power Company, involving an expenditure of about $50,000, which will include a transmission line from Lorretto Heights to Morrison Road, 5½ miles long; new substation at Englewood; revamping entire distribution system at Englewood, so as to complete three-wire service; revamping substation at Military Junction, and connecting all branches of its transmission lines so as to insure duplicate service at any point.

FALLON, NEV.—The City Council contemplates the installation of a municipal power plant, to cost about $40,000. Electricity is now purchased for the municipal system.

Canada

PORT ARTHUR, ONT.—The Hydro-Electric Power Commission of Ontario, it is stated, will make Port Arthur the power distribution center for the southern section of the Nipigon zone. A permanent distribution station, to cost about $600,000, will be erected here.

LAC BOUCHETTE, QUE. — The Lac Bouchette Electric Company contemplates building a small dam and power house, to cost about $10,000.

Electrical Patents

Announced by U. S. Patent Office

(Issued June 10, 1924)

1,497,394. ALTERNATING-CURRENT MOTOR; H. E. Warren, Ashland, Mass. App. filed Aug. 4, 1919. Self-starting synchronous-motor. Miniature type, with double rotor.

1,497,399. AUTOMATIC LIGHTING AND SOUND-PRODUCING DEVICE; C. A. Bailey, Chomwell, Conn. App. filed Oct. 25, 1920. For alarm purposes.

1,497,401, 1,497,402. REGULATING SYSTEM; C. A. Boddie, Pittsburgh, Pa. App. filed Sept. 16, 1918. To prevent "anti-hunting" in induction regulator.

1,497,411. TRANSFORMER; J. C. Snell, Oak Park, Ill. App. filed June 2, 1922. Used as a coupler in radio apparatus.

1,497,412. SPEED REGULATOR SYSTEM; S. A. Staege, Pittsburgh, Pa. App. filed July 5, 1919. For governing the speed of waterwheels.

1,497,415. MOLDED OIL-FILLED CONDENSER; P. Thomas, Edgewood Park, Pa. App. filed April 21, 1921.

1,497,420. ELECTRICAL CONNECTING AND SUPPORTING PLUG; E. C. White, New York, N. Y. App. filed March 28, 1921.

1,497,423. AUTOMATIC TELEPHONE SYSTEM; B. D. Willis, Oak Park, Ill. App. filed March 29, 1920.

1,497,430. ELECTROLYTIC CONDENSER; L. W. Chubb, Edgewood, Pa. App. filed Dec. 30, 1919. For use in tuned or resonant circuits of variable voltage and variable frequency.

1,497,443. STARTING MECHANISM FOR AUTOMOBILES; C. H. Hodgkins, Pittsburgh, Pa. App. filed Jan. 6, 1921. Swings a pinion into mesh with the engine gear wheel upon energization of the motor.

1,497,447, 1,497,448. MOTOR-CONTROL SYSTEM; H. L. Keith, Edgewood Park, Pa. App. filed May 27, 1916. For elevators, hoists and similar mechanisms.

1,497,449. MOLDED CONDENSER; W. H. Kempton, Wilkinsburg, Pa. App. filed Oct. 16, 1917. Using molded covers.

1,497,457. MANIPULATION OF PHOTOGRAPHIC MATERIAL; A. S. McDaniel, New York, N. Y. App. filed Oct. 8, 1921. To prevent "static markings" on a motion-picture film.

1,497,459. AUTOMATIC TELEPHONE SYSTEM; R. Mercer, Liverpool, England. App. filed March 12, 1921.

1,497,469. MAGNETIC CORE AND METHOD OF MAKING SAME; B. Ames, Lowell, Mass. App. filed Feb. 10, 1919. Where core consists of a bundle of iron wires.

1,497,475. SPEED-REGULATING DEVICE FOR ELECTRICALLY DRIVEN VEHICLES; D. E. Battey, West Kensington, London, England. App. filed June 1, 1922. Automatic.

1,497,496. RADIO RECEIVER; M. S. Finley, Indianapolis, Ind. App. filed June 6, 1922.

1,497,551. AUTOMATICALLY OPERATED STATION INDICATOR; D. Davidson, Edinburgh, N. C. App. filed March 30, 1922. For use on street cars, etc.

1,497,554. PROCESS FOR ELECTRIC STEEL FURNACES; J. L. Dixon, Detroit, Mich. App. filed May 27, 1916. Using a transformer the windings of which are so arranged that the ratio between the primary and secondary voltages may be varied independently of the electrical load taken from the transformer.

1,497,557. EXTENSION PLUG; J. L. Eastman, Highland Park, and W. V. Gould, Detroit, Mich. App. filed April 22, 1922.

1,497,586. RADIO SWITCH; B. W. Prall, New York, N. Y. App. filed May 16, 1923. Plug and jack type.

1,497,628. ELECTRIC SOLDERING IRON; E. Young, Brooklyn, N. Y. App. filed March 19, 1924.

(Issued June 17, 1924)

15,859 (reissue). METHOD OF AND APPARATUS FOR TESTING MAGNETIZABLE OBJECTS BY MAGNETIC LEAKAGE; C. W. Burrows, South Orange, N. J. App. filed Oct. 4, 1917.

1,497,668. ELECTRICAL MACHINE; A. B. Broluska, Detroit, Mich. App. filed March 16, 1922. Direct-current motor or generator.

1,497,714. SECRET COMMUNICATION SYSTEM; L. Espenschied, Queens, N. Y. App. filed Jan. 28, 1921. By dividing the message frequency band into a plurality of sub-bands and subjecting them to different degrees of attenuation before transmission.

1,497,715. MULTIPLEX SIGNALING CIRCUITS; L. Espenschied, Queens, N. Y. App. filed July 1, 1921.

1,497,718. LOCK; G. E. Gilland, Grand Rapids, Mich. App. filed Jan. 18, 1921. For automobiles.

1,497,727. PROCESS AND APPARATUS FOR THE PRODUCTION OF PHOSPHORIC ACID; B. G. Klugh, Anniston, Ala. App. filed Dec. 7, 1920. Electric smelting.

1,497,734. FRAME FOR DYNAMO-ELECTRIC MACHINES; C. Ramoneda, Sarria-Barcelona, Spain. App. filed Sept. 29, 1920. Of the single-phase or polyphase type by the use of pressed metal and preferably sheet metal.

1,497,750. SPARK-PLUG TESTING APPARATUS; M. S. Hopkins, Columbus, Ohio. App. filed Sept. 10, 1921. For internal-combustion engines.

1,497,780. MOTOR CONTROL; A. A. Gazda, Chicago, Ill. App. filed Dec. 3, 1919. For electric elevators, etc.

1,497,786. BATTERY HOLDER; J. F. D. Hoge, New York, N. Y. App. filed Nov. 29, 1922.

1,497,790. ELECTRIC HEATER; M. Pember, Wichita, Kan. App. filed July 27, 1922. Radiant grid type for domestic use.

1,497,848. TELEPHONE; O. O. Hage, Crookston, Minn. App. filed Dec. 4, 1919. Microphone transmitters and co-operative receivers.

1,497,927. SENDING ARRANGEMENT; A. Meissner, Berlin, Germany. App. filed Sept. 3, 1921. For high-frequency oscillations as used in wireless telegraphy.

1,497,941. WIRE OR CABLE CLAMP; H. O. Rockwell, New Britain, Conn. App. filed April 3, 1922. Adapted to be attached to the necks of glass or porcelain insulators.

1,497,948. THERMIONIC DEVICE; I. Schoenberg, London, England. App. filed April 9, 1918. To produce intermittent electron emission.

1,497,978. PROTECTING MEANS FOR ELECTRIC CIRCUITS; E. H. Jacobs, Chicago, Ill App. filed Nov. 10, 1919. Resistance unit for lightning arresters.

1,498,031. PROCESS FOR THE PRODUCTION OF AMMONIA; B. F. Halvorsen, Christiania, Norway. App. filed March 30, 1923. In an electric furnace.

1,498,054. PORTABLE GARAGE LIGHT; R. E. Manley, York, Pa. App. filed June 8, 1923. With a stand.

1,498,059. THERAPEUTIC ELECTRODE; A. J. Tyler, Rochester, N. Y. App. filed Sept. 10, 1921. For application to the part of the body to be treated.

1,498,060. MAGNETIC SEPARATOR; G. Ullrich, Magdeburg, Germany. App. filed March 18, 1921. Of the revolving-ring type.

1,498,077. REGULATING SYSTEM FOR ELECTRIC GENERATORS; A. E. Doman, Elbridge, N. Y. App. filed Nov. 21, 1919. As used on automobiles.

1,498,080. JAR COVER OR CELL COVER FOR STORAGE-BATTERY CELLS; J. E. Erickson, Lincoln, Neb. App. filed Dec. 1, 1920.

1,498,090. ELECTRIC SWITCH; B. E. Getchell, Plainville, Conn. App. filed April 26, 1920. Of the safety type for motor protection.

1,498,129. WIRELESS-TELEPHONE RECEIVING APPARATUS; A. E. Spicer, New York, N. Y. App. filed June 5, 1923.

1,498,136. SUSPENSION OF ELECTRODE PLATES IN ELECTRIC ACCUMULATOR CELLS; F. Van de Wiel, Paris, France. App. filed Sept. 18, 1920.

1,498,140. TELEGRAPHIC RECEIVING APPARATUS; E. A. Wilson, Croydon, England. App. filed July 19, 1920. For automatic system.

1,498,146. ATTACHMENT PLUG AND CAP; R. B. Benjamin, Chicago, Ill. App. filed May 19, 1919. Polarized.

1,498,147. ADAPTER; R. B. Benjamin, Chicago, I.ll App. filed July 14, 1920. Of the Hubbell type for Edison plug.

1,498,148. RECEPTACLE AND CAP THEREFOR; R. B. Benjamin, Chicago, Ill. App. filed July 14, 1920.

1,498,157. HIGHWAY CROSSING SIGNAL; C. W. Dunham, Fairmont, Pa. App. filed March 31, 1921. For railroads.

1,498,167. PORTABLE AUTOMATIC ARC WELDER; M. F. Hill, New York, N. Y. App. filed April 26, 1919.

1,498,169. SECTIONALIZING END BELL; E. H. Jacobs, Chicago, Ill. App. filed April 17, 1919. For joining underground cables to overhead wires.

1,498,196. ELECTRIC PLUG; L. G. Pacent, Winfield, L. I., N. Y. App. filed Dec. 5, 1921. Of the telephone type for use with a jack.

1,498,253. FILAMENT HOLDER TO BE USED IN CONNECTION WITH THE REGENERATING OF ELECTRIC INCANDESCENT LAMPS; F. Voglhut, Augsburg, Vt. App. filed Dec. 15, 1921.

1,498,293. REGULATING TRANSFORMER; E. Poirson, Bellevue, France. App. filed Aug. 26, 1921. Does not interrupt circuit when voltage change is effected.

1,498,296. SCREWLESS TUBULAR CONNECTOR FOR ELECTRIC WIRES; A. C. Recker, Oakville, Conn. App. filed May 17, 1921.

1,498,321. LEAKAGE-PROOF ELECTRICAL APPARATUS; F. H. L. Holweck, Paris, France. App. filed Feb. 7, 1922. Applicable to vacuum-apparatus lead-in wires.

1,498,329. ELECTRIC FURNACE; J. Sokolowski, Milwaukee, Wis. App. filed Dec. 29, 1922. Electric stove combined with a water boiler.

1,498,330, 1,498,331. HANDLAMP SWITCH; A. L. Staples, New Haven, Conn. App. filed Feb. 21, 1921. For portable electric lamp.

1,498,332. HANDLAMP; A. L. Staples, New Haven, Conn. App. filed Feb. 21, 1921. Portable electric lamp.

1,498,346. LOW-VOLTAGE STARTING SYSTEM ON HIGH SERVICE MAINS; W. W. Bucher, Chicago, Ill. App. filed Aug. 20, 1917. For automatic electric generating system.

1,498,347. AUTOMATIC CONTROL SWITCH; W. W. Bucher, Chicago, Ill. App. filed March 20, 1919. To control the starting, running and stopping of isolated electric generating plants which are driven by internal-combustion engines.

1,498,359. BATTERY-PLATE BUILDING; H. F. Dodge, Toledo, Ohio. App. filed Feb. 23, 1923. For storage batteries.

1,498,360, 1,498,361. CIRCUIT-CONTINUING DEVICE; H. A. Douglas, Bronson, Mich. App. filed Jan. 26, 1920. Contact device as applied to electric headlamps on automobiles.

1,498,393. APPARATUS AND PROCESS FOR PRODUCING COMBINATIONS OF GASES; K. B. McEachron, Lafayette, Ind. App. filed Sept. 26, 1921. Through the agency of electrical discharges.

1,498,405. ELECTRIC LAMP; W. H. Spencer, New York, N. Y. App. filed March 30, 1922. Reading lamp.

1,498,420. ARC GAP; C. E. Bennett, Decatur, Ga. App. filed April 1, 1921. As used on protective apparatus.

1,498,424. COMBINATION TELEGRAPH INSTRUMENT; A. J. Christopher, Baldwinsville, N. Y. App. filed May 14, 1920.

1,498,478. DIRECTION INDICATOR FOR AUTOMOBILES; G. Oppenlander, Portland, Ore. App. filed April 12, 1921.

1,498,495. ELECTRIC LIGHTER; B. J. Van der Stigchel, The Hague, Netherlands. App. filed Aug. 25, 1922.

1,498,500. VACUUM-TUBE ADAPTER; F. Wilhelm and W. Schwarz, New York, N. Y. App. filed April 11, 1922. For connecting the various types and sizes of vacuum bulbs into a standard base.

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1,498,529. EXERCISING MACHINE; J. B. Allen, Brighton, Col. App. filed Nov. 21, 1921. For exercising the human body.

1,498,530. CONTROLLING SYSTEM; W. P. Albert, East Orange, N. J. App. filed May 11, 1921. Impulse-sending mechanism.

1,498,536. APPARATUS FOR PRODUCING CONTINUOUS ELECTRICAL OSCILLATIONS; S. N. Baruch, Palo Alto, Cal. App. filed Aug. 2, 1920. Of radio frequency.

1,498,544. ELECTRICAL SELECTIVE SYSTEM; C. B. Fowler, New York, N. Y. App. filed March 9, 1920. For use in automatic or semi-automatic telephone-exchange systems.

1,498,554. STORAGE BATTERY; F. T. Lahey, Akron, Ohio. App. filed July 10, 1922. Separators extending below the plate and serving to support the battery elements.

1,498,560. TESTING DEVICE FOR TELEPHONE-EXCHANGE SYSTEMS; E. R. Lundius, Brooklyn, N. Y. App. filed Dec. 22, 1922.

1,498,561. SECONDARY BATTERY; J. O. Luthy, San Antonio, Tex. App. filed Feb. 14, 1921. With special form of plate guard and separator.

1,498,568. EQUALIZATION OF CARRIER TRANSMISSIONS; H. S. Osborne, New York, N. Y. App. filed July 9, 1920. In which carrier currents are employed for the transmission of signals.

1,498,580. STOP SIGNAL FOR AUTOMOBILES; R. V. Rule, Clyde, Ohio. App. filed Sept. 20, 1921.

1,498,582. ELECTRODE HOLDER; C. W. Soderberg, Christiania, Norway. App. filed Jan. 24, 1921. For holding large electrodes such as are used in electric furnaces.

1,498,586. IMPULSE STARTER; J. R. Stark, Racine, Wis. App. filed Oct. 6, 1920. For use in connection with an internal-combustion engine ignition magneto.

1,498,592. TELEPHONE SYSTEM; J. F. Toomey, New York, N. Y. App. filed Dec. 23, 1921. Signaling arrangements between exchanges.

1,498,597. MICROPHONE; E. Weintraub, New York, N. Y. App. filed May 1, 1919.

1,498,622. STRAIN INSULATOR; W. T. Goddard, Hamilton, Ontario, Canada. App. filed Oct. 25, 1919. For use on high-tension lines.